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VETERINARY MEDICINE

JULY 1943

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Rats and mice are distributors of forms of dysentery as well as plague, typhus, spirochetosis and ratbite fever.

The estimated decline of livestock in enemy-occupied Allied countries as a consequence of the lack of feeding-stuffs, requisitioning and slaughter, is 11,000,000 cattle, 3,000,000 horses, 12,000,000 hogs and 11,000,000 sheep.—*Vet. Rec.*

Trichophytosis (athlete's foot) was practically unknown in this country until our soldiers brought back "sprig itch" and "dhobie itch" from Cuba and the Philippines after the Spanish American War. Now the annual cost of it is greater than the $50,000,000 appropriated by the Congress for the conduct of that war.—*Hygeia.*

Of proteins, those found in meat, eggs and milk have the highest biological value, i.e., they have the largest proportion of essential amino acids. They constitute an irreplaceable essential in the diet of man and carnivorous and omnivorous lower animals. For a man weighing 175 pounds the average daily requirement of protein is about 80gm (3⅔ oz.). This is not affected by muscular activity. Men at hard physical work require more energy producing foods, carbohydrates and fats, than those of sedentary habits but not a greater amount of protein.

Approximately one-half of all meat consumed by our armed forces is beef.

In experiments made with poultry by Trager of the Rockefeller Institute for Medical Research at Princeton, it was found that biotin plays an important role in resistance to malaria.

Almost any animal, including man, will, after eating a large portion of uncooked egg white, develop rough patches of exfoliative erythema at the corners of the mouth, hair will fall out and difficulty in walking will be experienced. The symptoms disappear when a normal diet is resumed. The condition is a vitamin H (biotin) deficiency. It is caused by the neutralization of vitamin H by avidin, in which egg albumen is very rich.

Diaminodiphenyl sulphone seems to have the possibility of a wide veterinary future in streptococcal infections in large animals.[1] It is reputed to be three to five times as active as sulfanilamide and four to five times as active as sulfapyridine. A peculiar feature is that it is markedly toxic for small animals and humans but has a relatively low toxicity for cattle. It has been used by McEwen and others in the treatment of mastitis with encouraging results.

[1] Gould, G. N., 1943. *Vet. Rec.*, 55:9, p. 107.

Army Enlistment for Veterinary Students

1. *General.*—In order to assure the Army the annual loss replacements for medical, dental, and veterinary officers, the Army Specialized Training Division has been directed to train a sufficient number of enlisted men, who upon receipt of the appropriate degree in medicine, dentistry, and veterinary medicine may be appointed in the Medical, Dental, or Veterinary Corps, Army of the United States. Such training will include both a preprofessional and a professional phase, and so far as possible will be continuous.

2. *Professional students.*—There are now in approved schools of medicine, dentistry, and veterinary medicine approximately 24,000 students who hold commissions in the Medical Administrative Corps, Army of the United States, or in the Officers' Reserve Corps, and who are on an inactive status for the purpose of completing their professional training with a view to appointment in the Medical, Dental, or Veterinary Corps, Army of the United States. The discharge of these students at their own request from their commissions and their enlistment in the Enlisted Reserve Corps have been authorized. Students so enlisted will be ordered to active duty at the end of the current academic period and assigned to the AST unit at the college or university in which they are currently matriculated. Processing through reception centers will be accomplished in such a manner as to cause the least disruption of school activities.

Medical, dental, and veterinary students in good standing in approved schools of medicine, dentistry, and veterinary medicine, not under Army jurisdiction, if inducted under Selective Service subsequent to June 30, 1943, will be assigned with the least practicable delay to the AST unit at the institution in which currently matriculated.

★ ★ ★ BUY WAR SAVINGS STAMPS AND BONDS

This year Holland's cattle herds will be halved by German requisitioning, say Dutch experts. The approximate number remaining will be 800,000 milk cows and 500,000 calves, heifers and bulls. It will require many years after the war is ended to restore these herds to normalcy.

★ ★ ★ ★

The Proper Spirit

It takes faith to plant crops when labor to harvest them is not in sight. It takes greater faith to go onto a foreign battlefield without the food and bullets in sight with which to win. But the boys are going to those battlefields and in many cases paying the last supreme price. We are not going to fail them. The crops will be planted—and harvested.—*The Idaho Farmer*

★ ★ ★ ★

Veterinarian's Experiment Helps War Effort

A remarkably successful pioneer experiment to salvage the lowly but all important commodity, grease, essential in the manufacture of glycerine, has been going on at Ft. McClellan for the past several months. U. S. supply of glycerine, a basic in the manufacture of many explosives and other war materials, has been dwindling at an uncomfortable rate, and efforts to secure fats from housewives have so far not been sufficiently productive.

Lt. Col. Charles C. Wright, station veterinarian and conductor of the experiment which he says is the first to be tried in an army post, believes that results have proved its worth and that it will be converted to practical use by this post and eventually every army post, and will yield at least 50,000,000 pounds of grease from army camps per year.

A pound of grease per week per man has been salvaged through use of the open kettle method of rendering all greasy garbage—which is most garbage. Improved equipment will increase this yield.

An incidental advantage to the camp from the process is that instead of receiving 1½ cents per man per month for garbage refuse it receives 5 cents per pound for the grease or approximately 20 cents per month per man.—*McClellan Cycle.*

Rats Used in New Pregnancy Test

A new 97% accurate pregnancy test has just been demonstrated before a meeting of the New York State Medical Society at Buffalo. Whereas older tests required from 48 to 96 hours this new speedy, low-cost test indicates within two hours if pregnancy exists in the patient who is being tested.

Heretofore rabbits have been used extensively for such determinations, but the demand for this animal for breeding purposes for food has made the cost almost prohibitive. In the new test rats are utilized at a fraction of the cost.

Kidney excretions of a pregnant woman when injected into an infant rat will cause marked engorgement of the blood vessels of the ovaries of the rat within two hours. When the patient is not pregnant, this test is 100% accurate while in the rabbit test there is up to a one per cent inaccuracy in the case of a non-pregnant woman.

Extensive Serum Albumin Production

Serum albumin, which is produced from blood at Red Cross donation centers for use as a blood substitute in transfusions, is a more concentrated product than is the plasma. The requirement for one unit of serum albumin is 3½ pints of blood as compared with one unit of dried plasma from one pint of blood.

The principal advantage, at least from a utilitarian standpoint, that serum has over plasma is that a kit containing three units of serum albumin weighs about one pound less than a kit containing only one unit of the plasma. Unlike the plasma, the serum is in solution.

A new serum albumin processing plant is to be constructed at Ft. Worth, Texas, by Armour and Company. The Navy Department requested such a processing center at Ft. Worth for the blood donor services to be set up in San Antonio, Houston, Dallas, New Orleans and Ft. Worth. It is expected that this center will be processing 10,000 units per week by November.

★ ★ ★ BUY WAR SAVINGS STAMPS AND BONDS

One fifth of the population of the world lives in India.

Taylor, University of Texas, has developed a method by which a powerful tumor-producing filtrate may be obtained from tumor tissue. The agent, which passes a Berkefeld filter, when injected into mice subcutaneously gives rise to a rapid inception and tumor growth and affords support to the theory that at least some tumors are due to the action of viruses.

Substitutes for Agar-Agar

In accordance with a suggestion of the WPB that agar be conserved, the Jefferson Medical College, Philadelphia, has developed a procedure by which agar may be recovered from discarded culture media.[1]

In some of the South American countries[2] cocoanut water has been used as a culture media for a number of years. When it is used to grow bacteria pathogenic to man, the cocoanut water is alkalized.

Several different types of seaweed from which agar can be made, have been located by Dr. Hugo L. Blomquist[3] of Duke University, after 10 months investigation in Puerto Rico.

Of five species of red algae, which can be harvested in moderate quantities at La Jolla, Calif.,[4] and which previously had been considered non-agariferous, four have been found by scientists of Scripps Institution of Oceanography to readily yield agar equal in quality and quantity to that at present produced from other red algae.

A new and promising substitute for agar is Carragar,[5] a non-priority carragheen derivative now being produced on a large scale on the site of the old Irish moss industry at Scituate, Massachusetts, by the Krim-Ko Company of that city. Carragar is designed to replace agar in major part or in its entirety in bacteriological and genetics laboratories—for example in the preparation of pour plates for water and milk work and for semi-solid and deep stab culture media.

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[1] *Science*, Jan. 15, 1943. 97:2507, pp. 76-77.
[2] *Bol. Oficina San. Panamericana* (Washington, D. C.), Oct., 1942, p. 960.
[3] *Scientific American*, Jan., 1943, 168:1, p. 21.
[4] *Science*, Jan. 22, 1943. 97:2508, p. 89.
[5] *Food Materials and Equipment*, April 30, 1943.

Endemic Typhus Fever Isolated from House Mice

From the Typhus Research Laboratory, Savannah, Georgia, comes the report of the isolation of a strain of typhus fever virus. It was recovered in September from the pooled brains of seven mice. Rats in this area have heretofore been found infected with this virus. Passage was made through 28 generations of guinea pigs—60 animals were used and 58 of them developed clinical evidence of typhus.—*Public Health Reports*, Jan. 22, 1943.

Use for New B Vitamin—Folic Acid

That white blood cell anemia, induced in both monkeys and rats by diet and also by sulfa drugs, may be prevented by one of the newest of the B vitamins—folic acid, has been demonstrated by C. A. Elvehjem and others. The doctor suggests that in humans such a condition may develop following 20 days of sulfa drug treatment. It would seem that folic acid may be the answer for treatment of at least some of the disturbances caused by sulfa drugs among our armed forces.

Wider Use for Caudal Anesthesia

The new continuous caudal anesthesia, heralded so widely as a specific for painless child-birth, has been used by doctors of the U. S. Public Health Service in 255 cases of general surgery with only three failures. This new anesthetic may prove a boon to the war-wounded as the doctors report favorable results in setting of bones and in amputations as well as in other forms of surgery and they believe the method to be adaptable for use in the treatment of casualties in both civil and military practice where prolonged analgesia is desirable —for instance, during transportation and in physical and roentgenologic examinations. It may become possible to give this anesthetic to war-wounded in the field and thus transport them painlessly to a base for further treatment, and it may reduce instances of shock, also the delayed shock condition called a "crush syndrome."

In case of tubular wounds with small apertures, Legroux recommends the use of sulfonamide "crayons" about two inches long, each containing two grams of the drug. The writer suggests that this method of treatment would be particularly valuable in the local treatment of the vagina and uterus in small animals. Gelatine capsules containing the drug, or tablets intended for oral administration, could be used under similar circumstances.—H. C. Swann, *Indian Veterinary Journal.*

Seeing-Dogs Allowed Rationed Meat

The OPA made available, May 24, limited quantities of a variety of low point rationed meats, when horse meat cannot be had, for feeding trained dogs which serve as "eyes" for blind persons. Rationed meat of about 3 point value is suggested and the applicant must show that his dog has been fed considerable meat and that he is unable to obtain horse meat, also that he requires the assistance of the dog which has been especially trained to guide blind persons.

Research Council Sets Up Food Composition Group

At the request of the Quartermaster General of the United States Army, the National Research Council's food and nutrition board has organized a committee on food composition with Dr. C. A. Elvehjem as chairman, to collect, coordinate and appraise food composition data. The committee is to act as the repository and point of dissemination for authentic data on all foods being used or considered for use by all branches of the military services.

Proximate and mineral composition as well as analyses for vitamins A, C, thiamine, riboflavin, and niacin are required as a basis for nutritional evaluation of these foods. Data on new products, processed foods and dehydrated meats, fruits and vegetables especially are needed.

The committee has already enlisted the cooperation of federal and state laboratories as well as laboratories of food industries, throughout the country.—*Science.*

Frozen Nerve Fragments for Grafts

At a recent meeting of the American Neurological Association in New York, Dr. Paul Weiss announced a method of storing nerve fragments for grafts. These particles are frozen at 150° below zero Centigrade, dehydrated in a high vacuum, sealed and stored. They can be kept indefinitely. Before use a fragment is rehydrated and, when grafted, the nerve tissue is readily and fully pervaded by regenerating nerve fibers much as if it were living. Doctor Weiss also uses sleeves of fresh or frozen-dried arteries as an aid in neurosurgery.

★ ★ ★ BUY WAR SAVINGS STAMPS AND BONDS

Dehydrated Eggs for the Armed Services

The armed forces will use 42 million pounds of dehydrated eggs in 1943. As this is but slightly more than 10% of the total production of dried eggs, the government, which purchases only the best grade procurable, will be able to select a high quality product for its fighting men.

Economy of shipping space and improved keeping qualities are the dual reasons for dehydrating eggs. A case, 30 dozen shell eggs, weighing, with the case, nearly 60 pounds go into a ten-pound can when reduced to egg powder, and the palatability is unimpaired.

Preservation of eggs by reducing the moisture content to 5% leaves something to be desired. At temperatures below 50° F. the solubility and palatability of egg powder is retained indefinitely but at temperatures above 85° F. deterioration in both respects is rapid. Research to improve the keeping quality at tropical temperatures is being prosecuted vigorously.

Like all other food products of animal origin, eggs and egg powder must pass inspection by the Veterinary Corps before acceptance by the army. The plants in which the eggs are dehydrated, like other plants in which food for the army is processed, must be approved by an officer of the Veterinary Corps after a careful sanitary inspection.

Propamidine—a New Antiseptic

A new wound antiseptic, propamidine, the action of which is not checked by p-aminobenzoic acid (as are the sulfa drugs) nor by peptones, tissue fluids or pus, has been discovered.

Propamidine is applied in a jelly on infected burns and flesh wounds which are then covered with a vaseline gauze. The germs are destroyed in a few days and the wounds heal rapidly. The antiseptic is used on alternate days and five treatments are given.

Appropriations

Heretofore the several million dollars annually appropriated by the Rockefeller Foundation for its various public interests, has seemed a munificent sum but, in comparison to the huge amounts of public funds spent in the war emergency, it dwindles to insignificance. It is estimated that the eight million dollars appropriated by the Foundation for 1942 would take care of the present war expenditures of the U. S. Government for about 45 minutes.

Antianemia Vitamin Isolated in Pure Form

Isolation and crystallization of the antianemic vitamin—half a million times more potent than fresh liver—was announced by the Research Department of Parke, Davis & Company, April 30. The new vitamin is a member of the vitamin B complex. Its discoverers call it vitamin B_c. The "c" to represent the thousands of chicks on which experimental studies were made.

The existence of the antianemic B_c vitamin was first announced by Professor A. D. Hogan and associates at the University of Missouri. They observed that chicks placed on a supposedly sufficient diet failed to grow and developed severe anemia, and that this could be cured by adding crude liver extract. Doctor Hogan was able to make a 300-fold concentration of this antianemic factor from liver. Their work became the basis for extensive research which finally led to the isolation of this antianemic vitamin in pure crystalline form, which represents a 500,000-fold concentration of the antianemic activity present in the liver.

American Veterinarians Wanted in New Zealand

Because of a steadily growing consciousness on the part of farmers of New Zealand of the value of keeping livestock healthy there are increased opportunities for veterinarians in New Zealand. The Dairy Board is the body set up by the Government to deal with the affairs of the co-operative dairy industry. These opportunities which I mention are principally in the highly developed dairy industry where the practice is largely confined to dairy cattle and swine, but it is expected that within the next few years schemes will be developed which will include other classes of livestock.

Practice under good conditions with salaries that compare favorably with those in other countries is now available. Those in charge of our veterinary schemes consider that young men will be the ones most interested and most adaptable to the conditions of life in a new country. Any veterinarians interested will be put in touch with an association prepared to make them a definite offer.

Veterinarians so employed will not have to undertake the many risks associated with starting up in private practice. The dairy industry, through co-operative dairy associations, provides salaried practice under conditions that compare favorably with any in the world. In some cases individual dairy companies pay a veterinarian on a full-time salaried basis to service the dairies that supply them. Up to the present the work has been concentrated on the treatment, but it is likely that as time goes on and additional veterinarians are procured the ideal of disease prevention will be the major one operating in these schemes.

The New Zealand Dairy Board does not itself control any of these schemes, but it has detailed knowledge of them, and of the methods of working, and it will put any veterinarians who desire further particulars, in direct touch with the co-operative associations who can offer opportunities for employment. Details of these New Zealand opportunities may be had by writing to the New Zealand Dairy Board, P. O. Box 866, Wellington, New Zealand.

Trying to follow a war through cracks in the censorship is like child's play compared with trying to follow the war inside the body when bacteria or viruses invade it.—*Plague on Us.*

* * * *

A sow is healthier and more of her pigs survive when she is fed a 15% ration of alfalfa, according to experiments conducted at the Wisconsin experiment station. It was found that brood sows receiving this amount of alfalfa raised twice as many pigs to weaning age as the sows getting only 5% of the hay. Tests showed that it is profitable to use 10% of high-quality hay or alfalfa meal but that 20% is too costly per pound of gain. The source of the well-being and increased weight of the sucklings seems to be caused by the stimulating effect of the alfalfa in the production of milk.

Older pigs, from 50 to 200 pounds market weight, fed with equal parts of tankage and soybean meal in a ration to which was added 15% of alfalfa, make economical gains, however, those fed only 10% of alfalfa did not lag far behind in gain.

* * * *

Let Us Keep Veterinary History Straight

In your article appearing in the April, 1943, issue of VETERINARY MEDICINE, entitled "The B. A. I. Loses Meat Inspection," so many pleasing statements were presented about Bureau achievements, it is with great reluctance that I feel compelled to point out a distortion of facts which should not be permitted to stand uncorrected. Let us keep veterinary history straight. If the presumption that "opposition to the importation of Argentine beef and the brucellosis eradication project" were responsible for the transfer mentioned, why should the Bureau continue to have under its supervision both these activities in its Field Inspection and Tuberculosis Eradication Divisions, respectively? This is not the time nor the place to discuss this question in detail, but it should be stated assurances have been given me to the effect that the move was intended as a war measure and would continue only for the duration. Naturally any action of any kind which might result in winning the war even a day earlier would

be quite acceptable to me. The quicker this occurs, the better for our country. The danger lies in misrepresenting facts, drawing erroneous conclusions and otherwise upsetting morale. For instance, the comments on the so-called Argentine meat question reveal little comprehension of the considerations involved or knowledge of conditions and developments. In the first place, the provisions of the governing statute (section 306 (a) of the Tariff Act), which the Bureau is still charged with administering, are applicable to a great many countries as will be noted in B. A. I. Order 373. As they are mandatory, conferring no discretionary authority upon administrative officials, it is not clear how the Bureau could remain detached from any question arising in relation to their application. In respect to proposed legal measures to modify the prohibition in the law to a limited extent, the Bureau has done exactly as suggested by the editor; i.e., it has, upon request, rendered opinions based on the best scientific information available, in the meantime continuing to administer the statute as it stands.

In the second place, in stating in effect that consideration of the question has been chiefly political and commercial and only about 1% sanitary, the author calmly ignores "the best scientific information" available. It has been established scientifically that the virus of foot-and-mouth disease can and does survive for long periods in certain tissues of frozen fresh carcasses of susceptible animals. Moreover, in a country where the disease is generally prevalent it is impossible to insure against the entry of infected carcasses into the export trade, for the reason that the highest concentration of the virus in the animal body is before there are any manifestations of disease that are discernible on anti-mortem or post-mortem inspections. It is also well known that virus may be conveyed directly to swine through the feeding of garbage which includes scraps from such infected carcasses.

The editor evidently ignores the history of foot-and-mouth disease and its appearance in various countries during the years after the first world war. Since January 1, 1927, when the first prohibitory order became effective, there has been only one outbreak in this country (January-February, 1929) in which case it was definitely established that the inclusion of scraps from South American fresh meat in garbage fed to swine was the medium of introduction. Canada, which also excludes fresh meat from infected countries, has remained entirely free. On the other hand, Great Britain, which regularly imports large quantities of chilled or frozen fresh meat from infected countries, has been uninterruptedly free of the disease for as much as six months only once during those 16 years, although they have adhered to the drastic slaughter method of eradication.

During 1942 an unusually severe and widespread epizootic of foot-and-mouth disease occurred in certain parts of South America beginning about March and continuing for several months. Starting last June Great Britain experienced a series of widely scattered primary outbreaks and an official announcement of the Ministry of Agriculture and Fisheries stated that almost every one of these was associated with the use of garbage on the farm, the disease first appearing among pigs thus fed or among cattle on farms where swill was used for feeding pigs. It will be observed that there had been time for South American beef shipped during March and April to reach and be distributed in Great Britain. Furthermore, all countries, other than those in South America, from which Great Britain obtained its meat supplies during that period—Australia, Canada, New Zealand, Union of South Africa and the United States—were free from foot-and-mouth disease.

Regarding brucellosis, this cooperative work was undertaken in 1934 when there was a large surplus of cattle in the country with prices very low. This provided an opportunity to eliminate large numbers of cattle reacting to the blood test where the owner desired such action to be taken. Thousands of owners in various states not only desired it but actually demanded it. As far as the Federal Government is concerned, the program is and always has been entirely voluntary. As this is a cooperative project, work within a State is governed as always by the State laws and regulations. How anyone familiar with the results of

this work could claim that this program has failed and has been costly to the Bureau in friends and prestige is difficult to understand. In all disease eradication programs there have been disappointments and these will, of course, continue to occur, but it is well known that the incidence of brucellosis in cattle in this country since this work began has been reduced by more than one half. This means much progress has been made and the savings have been great. The state legislatures have, in all but 8 States, made provision for indemnity funds in this work, and in two States, namely, New Hampshire and Maine, bond issues have been provided which will make sufficient funds available to keep up the work of testing and other features that are deemed necessary and advisable.

There are now 568 counties in 24 States in the modified accredited Bang's disease-free area, and work under the area plan is being conducted in about 140 additional counties, all in cooperation with the State livestock sanitary officials and the cattle owners.

Furthermore, hundreds of practicing veterinarians in this country have been employed by the Federal Government especially in the beginning of this work at the time when their regular practices were much reduced in volume due to economic conditions and the extensive drought.

Concerning the criticism of the attitude of the Bureau in delaying the adoption of the use of the Brucella vaccine, it may be stated that many research projects and studies of the use of this material under field conditions were necessary. It is well known that there were many in high authority who maintained that the use of the vaccine would be detrimental. It took time and the publication of results of its use to bring about a general favorable recognition of this branch of the project. From the latter part of 1940 when calfhood vaccination was made a part of the official work, up to the present over 300,000 calves have been vaccinated under cooperative supervision. About 20,000 such animals are being officially treated with the Brucella vaccine monthly.

In conclusion it should not be forgotten that the Bureau was a leader in exposing worthless so-called abortion serums, colored cornstarch cures, sweetened feed preventives, and abortion vaccines which were claimed to be highly satisfactory but which contained various organisms other than the causative agent of bovine brucellosis.

J. L. MOHLER

COMMENT: The chief's letter is informative but irrelevant.

1. There was nothing in the article to which it refers that even remotely discussed the soundness or unsoundness of the exclusion of Argentine beef, or which referred to the manner in which the present law has been administered. Only the statement that opposition to a change in the law displeased influential persons in high places. This is unquestioned.

2. Foot-and-Mouth disease was not mentioned nor considered, so its history could not have been ignored. However, since the matter has been brought up, just to keep the record straight, it may be mentioned that there was no proposal to import meat from districts in which foot-and-mouth disease is present.

3. The merits or progress of the brucellosis campaign was not mentioned nor in any way under consideration. Certainly there is no intimation that it has, or has not, been a failure. Only its effects on friends of the Bureau were discussed. This may be evaluated by reading the 1940 files of leading farm and dairy papers.

It is gratifying to learn from the Chief's statement (and this is the only thing in it that has even a remote bearing on the article to which he refers) that assurances were given that the transfer of the Meat Inspection Division out of the Bureau was a war measure and only for the duration. Unfortunately this assurance was not a part of the order of the Secretary of Agriculture nor anywhere put in writing. It will be more difficult to tie to later, on this account.

What contribution the transfer of meat inspection from the Bureau, can make the prosecution of the war is not apparent, but may be valid nevertheless. Of course, none can object to any change made for that purpose.

Penicillin

THIS statement[1] is designed to acquaint the medical profession with the progress of efforts which are being made by the Committee on Medical Research of the Office of Scientific Research and Development, by the Division of Medical Sciences of the National Research Council and by certain commercial companies to promote investigation of the therapeutic usefulness of penicillin and to increase the available supply of this remarkable substance. They were initiated and are continuing as a phase of the war effort, directed primarily toward the benefit of our armed forces.

Penicillin was discovered by Fleming in London in 1929. The first information concerning its unique therapeutic possibilities was revealed in the publications in the *Lancet* (1940 and 1941) of experimental and clinical studies by Florey, Chain and their collaborators of Oxford. The intense interest in it now manifest in this country was initiated not only by those papers but by personal communications with Professor Florey during his visit to this country in the summer of 1941.

Florey's visit was arranged by the Rockefeller Foundation. After conferences with interested members of the National Research Council and the U. S. Department of Agriculture, Florey and his colleague Heatley proceeded to the Northern Regional Laboratory of the Department of Agriculture at Peoria, Ill., where studies were at once initiated by Dr. R. D. Coghill and Dr. A. J. Moyer on cultural characteristics of Penicillium notatum, the organism which makes penicillin, and on methods of purification of that substance. These studies are still continuing and have been of great value to those who are undertaking the production of penicillin.

Returning from Peoria, Florey consulted with several commercial companies in the hope that they might undertake production developments. His efforts in this direction were supported by encouragement from the Committee on Medical Research and the National Research Council, and in the early autumn of 1941 research looking toward production was begun in the laboratories of Merck and Company, E. R. Squibb and Sons, Charles A. Pfizer and Company, the Lederle Company, and perhaps others of which we were not aware. That research has continued; the interest of other companies has been aroused until today some sixteen companies are engaged in or intend to become engaged in the production of penicillin. In no instance has production advanced beyond the pilot plant stage; in the majority it is still in the laboratory stage.

The difficulties which confront large scale production are very great. They arise chiefly from the fact that in the metabolism of the mold only very minute amounts of penicillin are formed and those only after days of growth. A yield of as much as one gram of the purified product from 20 liters of culture fluid would be regarded as exceptionally high. In impure solutions penicillin is unstable; it is destroyed by bacterial or other contaminations to which the culture fluids are highly susceptible. Difficulties have been encountered in choosing the most productive strains of the mold and the most suitable culture mediums, in the development of methods for extraction and purification and in stabilization of the purified product.

The first clinical tests of penicillin in this country were reported by Dawson of Columbia in 1941. Other supplies became available in 1942, and in June of that year the Committee on Chemotherapeutic and Other Agents of the National Research Council, under the chairmanship of Dr. Chester S. Keefer, was invited to organize and supervise clinical investigations in selected hospitals, the records to be coordinated by Dr. Keefer and his committee. The costs of these studies, now proceeding in some twenty civilian institutions, are provided by contract with the Office of Scientific Research and Development, recommended by the Committee of Medical Research. The results will be published in due course.

Six weeks ago arrangements were made by the Surgeon General of the Army for clinical tests at the Bushnell General Hos-

[1] Report of Committee on Medical Research, A. M. A. (May 22, 1943), *Jnl. A. M. A.*, 122:4, p. 235.

pital, Brigham City, Utah. There were to be found among soldiers returned from the Pacific area many cases of unhealed compound fractures, osteomyelitis and wounds with long established infections. The results have been so encouraging that plans are now in process for undertaking similar wound studies in ten general army hospitals and venereal disease studies in six. A similar though less extensive plan will be pursued by the Navy.

The results of these investigations thus far have completely upheld the early promise contained in the reports of Florey, Chain and their collaborators. More than 300 patients have been or are being treated with penicillin. There is good reason for the belief that it is far superior to any of the sulfonamides in the treatment of Staphylococcus aureus infections with and without bacteremia, including acute and chronic osteomyelitis, cellulitis, carbuncles of the lip and face, pneumonia and empyema, infected wounds and burns. It is also extremely effective in the treatment of hemolytic streptococcus, pneumococcus and gonococcus infections which are resistant to sulfonamides. It has not been found effective in the treatment of subacute bacterial endocarditis. Studies of the results of its local application are still inadequate.

* * * *

Penicillin[1] is a bacteriostatic agent of immense power. A report[2] of its use in saving the life of a patient who was dying of blood poisoning, was made at a recent staff meeting of the Mayo Clinic by Dr. H. L. Williams and others. Penicillin was used after sulfadiazine had failed. When it was found by bacteriological examination that staphylococci were in the blood stream, penicillin was used. Some two quarts of a saline solution containing this agent were given each 24 hours for two days, the solution being dropped into a vein of the patient at the rate of 25 to 30 drops per minute. Within 22 hours the blood was free from the staphylococci and the temperature had dropped from 104 to 100° F.

Penatin, more powerful even than penicillin, has been extracted from the same mold as the latter. In laboratory experiments at dilutions of 1 to 12,500,000, penatin inhibits the growth of such organisms as anthrax, diphtheria, typhoid, brucellosis, pneumonia, etc. The activity of this agent, according to its discoverer Kocholaty, is much more bacteriostatic and bactericidal for *Br. abortus* and *B. coli* than is penicillin.

Notatin, a third extract from *Penicillium notatum,* exerts its powerful bactericidal activity only under certain very definite conditions. Oxygen and glucose must be present but there must not be any appreciable amount of catalase present. Under such conditions growth of *Streptococcus aureus* has been inhibited in dilutions of 1 to 1,000,000,000. It is also active in high dilutions on many Gram-negative and Gram-positive organisms.

* * * *

The Rockefeller Foundation Report for 1942 lists an appropriation of $4,860 to the University of Oxford for biochemical investigation of penicillin by the British scientist, H. W. Florey, who made public the first information concerning its therapeutic possibilities in 1940.

When this miraculous drug is produced in sufficient quantity that it becomes available for experiments by veterinary research scientists, it will doubtless prove of inestimable value in the treatment of diseases of livestock.

* * * *

Penicillin for Gonorrhea

Effective use of penicillin[1] in several patients with gonorrhea, in whom the infection was completely resistant to sulfonamides, is reported by members of the Mayo Clinic.[2] First negative cultures occurred in 17 to 48 hours. Treatment for 3½ days with high dilutions of the penicillin resulted in cures.

The investigators point out that, since most of the drug is excreted rapidly in the urine and that the high degree of solubility of the drug permits it to reach involved tissues readily, it should prove effective in the treatment of clinical infections due to sulfonamide resistant bacteria.

[1] Penicillin, 1942, *Vet. Med.*, 37:2, p. 57.
[2] *Science News Letter*, January 30, 1943.

[1] The penicillin was furnished by the Abbott Laboratories, Inc.
[2] Herrell, Wallace E., Edward N. Cook, and Luther Thompson (May 29, 1943), *Jnl. A. M. A.*, 122:5, pp. 289-292.

Practical Livestock and Poultry Nutrition

I. Introduction

By L. D. FREDERICK* and R. E. GRAY*
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TODAY a practicing veterinarian finds it difficult to enjoy a large degree of success without a thorough understanding of the feed needs of the poultry, livestock and dairy producers in the area in which he is practicing. This involves the judicious selection and blending of appropriate feeding stuffs, together with the education of the feeder in the proper methods of feeding. In addition to this, the veterinarian must understand the relative nutritive values of various ingredients available for use, and have a knowledge of the available supplies and costs of each.

During the present century, the older practice of feeding farm animals on feedstuffs produced largely on the farm and keeping the stock under more or less natural conditions has given way to methods of feeding in which by-products of industry are largely used, and the stock are, in many cases, kept under more artificial conditions. As a result of these changes in feeding and management, rations which in the past gave successful results often prove inadequate under modern conditions. Many cattle and hogs are confined in feed lots with little or no opportunity for foraging. At the same time rapid growth and efficient production are the requisites of a profitable livestock business. The animals are, therefore, almost entirely dependent upon the feeder to supply them with adequate amounts of high quality, nutritious, well-balanced rations designed to produce rapid economical growth. The feeder, in turn, is more or less dependent upon the feed manufacturer to supply the feedstuffs necessary for a well-balanced ration, or such feedstuffs as will supplement his home-grown grains.

Fortunately, as a result of modern nutritional science, mixed feed manufacturers can furnish feeds which will produce meat, milk and eggs at relatively low cost. The many pressing duties of day-to-day business make it difficult for feed mixers to keep abreast of modern nutritional developments, however.

This series of articles will discuss today's science of livestock nutrition as it applies to the business of mixing feeds. The functions of the vitamins, minerals, proteins, fats and carbohydrates are described, as are the requirements of the various types of livestock for these feed elements.

These articles answer many questions which farmers ask their veterinarians about feeds, and explain the modern science of formulating balanced livestock rations.

In these articles, it is necessary to consider feeding materials of average composition. It must be fully appreciated that the composition of a feed is very materially affected by the nutrients available in the soil on which it is grown. This factor must be taken into consideration when formulating feeds for localized areas in order to correct any possible nutritional deficiency.

In general, the formulation of a balanced ration must take into consideration the ability of that ration to meet the requirements of the animal for the various nutrients. The balanced ration may be in the form of a complete mixed feed to be fed as the sole ration, or a concentrate to supplement the home-grown grains. The protein in the ration should come from a variety of sources and be so blended that it is adequate both as to quality and quantity. All of the minerals required for optimum growth and optimum food utilization must be present in the balanced ration. In addition, vitamin and mineral requirements of the animal must be met. There must be sufficient roughage for proper functioning of the digestive organs. Fats and carbohydrates to supply energy economically, must be present in proper proportion for the purpose intended.

The following discussions will include no feed formulas. Rather, their purpose is to make it easier for the veterinarian to build his own feed formulas, using feedstuffs

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which he prefers on the basis of cost and availability.

Proteins—Composition

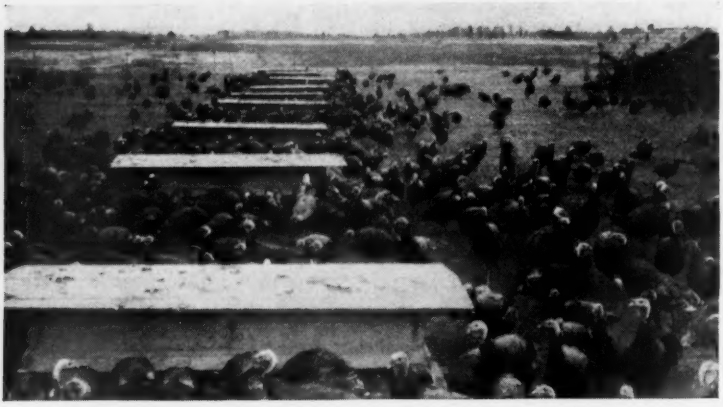
Proteins are very complex substances containing nitrogen and are essential constituents of both animal and vegetable cells. The importance of proteins in livestock and poultry rations has been recognized for years. That adequate protein must be supplied to the animal by the ration is given emphasis when one considers that all the vital tissues of the body contain protein as their chief constituent. Muscles, internal organs, blood, nerve tissue, connective tissue, the regenerative cells, and the skin together with its appendage (feathers, hair, hoofs, etc.) are all built from protein. Whereas plants and other members of the vegetable kingdom are able to manufacture proteins from the nitrogen in the soil, animals, to a large extent, lack this ability and must be furnished with sufficient amounts of proteins in their feed.

During the digestive processes, proteins are split or broken up into simpler substances called amino acids. The amino acids are later recombined to form new proteins which are usual in living animal tissue. Twenty-three amino acids occur commonly in vegetable proteins some of which contain all 23 acids; other vegetable proteins have fewer than this number.

Certain amino acids can be manufactured or converted from other amino acids within the digestive tract of the animal providing certain so-called *essential* amino acids are present in the proteins contained in the ration. The following are the technical names for the essential amino acids:

Methionine	Leucine
Histidine	Phenylalanine
Tryptophane	Lysine
Arginine	Threonine
Isoleucine	Valine

In addition to these, glycine has recently been shown to be required in fairly large amounts by poultry and hence is essential for chickens.



Twenty-five thousand turkeys were raised and fattened on this farm in 1942 with a loss from all causes of less than 6% from the incubator to the abattoir. The birds were on full feed at the time the photo was taken. The sarcophagus-like objects near the center of the field are self-feeders. They were filled once a week. Slaughtered for the Thanksgiving market, a majority of the toms were in the 16 to 20 pound class and were sold to the army. The establishment belongs to and is operated by Swift and Company at Alma, Michigan

Naturally, proteins lacking the essential amino acids are of lower feeding value than those recognized as complete proteins. For example, research has shown that satisfactory rates of growth result from feeding certain protein concentrates, such as the albumin or the casein from milk or animal protein found in good quality meat scraps and tankage or fish meal, while on the other hand the zein (the protein of corn) alone produces very poor results. This difference in growth is the result of the differing amino acid content of the proteins. Proteins also vary in degree of digestibility.

Depending upon their different feeding values, proteins have been classified into two groups; those of good biological value

(complete proteins), and those of poor biological value (lacking one or more essential amino acids). In general, proteins of animal origin (meat scraps, tankage, dried milk products, fish meal, etc.) are of good biological value. Certain vegetable proteins of leguminous origin (soybean oil meal, peanut meal, etc.) are also of excellent biological value. The other vegetable proteins are definitely of low biological value. It follows that leguminous proteins are the most complete of the vegetable proteins. They approach the animal proteins in relative feeding value.

Supplementary Value of Proteins.—It is possible to combine vegetable proteins with animal proteins in such a manner that the resulting mixture will have very nearly the same feeding value as that of the animal proteins alone. Certain vegetable proteins also supplement each other, although for best results some animal protein must be present in the ration.

Non-Protein Nitrogen Compounds.—There is another class of nitrogen compounds known as non-protein nitrogen compounds. They are found in small amounts in only a few of the common feeds such as rapidly growing grasses, crops cut at an immature stage for ensilage, and some molasses products. Ammonium salts and urea are examples of these substances. Although used in feeding they are obtained from other than the usual sources of feed. They are not classified as proteins, but recent nutritional research has shown that these compounds can fulfill some of the protein requirements of ruminants, for example, cattle and sheep. The present explanation is that certain bacteria in the rumen convert the urea or ammonium salt (bicarbonate) to protein in the same manner as higher plants convert the nitrogen of the soil into protein. This protein is then utilized by the ruminant in the same way that it utilizes protein supplied in the ration.

Urea or ammonium bicarbonate may take the place of proteins in the ration only to the extent that these substances may be transformed to proteins by bacterial growth during the limited time that they remain in the rumen. Cattle and sheep do very well on limited amounts of urea, but their general condition is not maintained quite so well as on protein concentrates.

The Energy Producing Nutrients

All life functions—growth, reproduction, and maintenance—require energy. In all feeds fats and carbohydrates are the primary suppliers of energy. Ordinarily, although fats contain more than twice as many calories per gram as do carbohydrates, but, because it is more expensive than carbohydrates, little or no fat is added to animal feeding materials. Livestock and poultry apparently require no more fat than is normally present in ordinary feedstuffs, practically all of which contain some fats. However, the chief sources of energy in animal feeds are the carbohydrates of cereal grains and grain sorghums.

Relative values of different grains in promoting growth.—It is important for the veterinarian to know the relative values of the different energy-producing feedstuffs. Many experiments have been carried on to determine just which of the different grains give the best results. This research shows that there is little difference in the capacity of the various grains to promote growth so long as the ration contains adequate amounts of all the necessary proteins, vitamins, and minerals.

The content of energy producing nutrients is not the only important factor in evaluating the cereal grains. Certain of the cereals are richer than others in important vitamins and minerals. In building a well-balanced ration these other nutritional qualities also must be taken into consideration. For example, if a properly balanced feed formula calls for yellow corn as one of the chief sources of vitamin A, it would be a serious mistake to substitute oats, wheat or barley, even though they might provide a lower cost source of digestible nutrients. If such a change were made, vitamin A from some other source would have to be added to the feed. This new source of vitamin A might be so costly that it would outweigh any advantage gained through changing from yellow corn to the

less expensive grain. In other words, the energy producing ingredient should be considered not by itself, but as a building stone which must be fitted together with many others to form a complete whole. Its contribution to the total vitamin, mineral, and protein content of the ration must be considered, The completed structure should supply all the essential proteins, vitamins, and minerals, as well as the energy-producing carbohydrates and fats, in an economical manner.

No other kind of poultry gains weight so fast as the duck. On this farm (Swift & Company, Alma, Mich.) 1000 ducklings are hatched daily, six days a week the year around. They are fed till nine weeks of age and slaughtered—dressing at that time 5 to 5½ pounds. Each duck consumes 22 pounds of feed during its lifetime. The loss from incubator to abattoir is ordinarily less than 3%—mostly crippled or deformed ducklings. In the incubator the eggs are turned every two hours, day and night

Crude Fiber in Livestock and Poultry Feeds

Crude fiber, the undigestible portion of an animal feed, is of importance to the proper functioning of the digestive system. Although normally digestion of crude fiber does not occur, in cattle and sheep bacterial action in the digestive tract converts some of the fiber into digestible carbohydrates. This action is, of course, limited to the time the feed is stored in the rumen and until the digestive juices proper start their tearing down process on the feed.

Swine do not digest fiber.—The hog, with its relatively small digestive tract, is not equipped to digest crude fiber. Hog rations must, therefore, contain a large proportion of highly digestible concentrates such as cereal grains, oil cakes, oil meals, and other feeds low in fiber. It is especially important that fattening pigs do not get too much fiber in their rations if they are to make fast, low-cost gains.

Ruminants can consume feeds high in fiber.—In contrast to swine, sheep and cattle have digestive tracts well suited to handling rations high in crude fiber—feeds which are most universally available on farms. It is usually not possible, however, for cattle to consume sufficient quantities of high fiber, bulky feeds to supply their protein and energy requirements. It is, therefore, necessary, especially in the case of high milk-producing dairy cattle, and in fattening beef cattle, that concentrates be fed. These concentrates should carry an ample amount of high-quality protein, the necessary minerals and adequate amounts of energy producing feedstuffs.

Poultry feeds should be low in fiber content.—Poultry have very simple digestive tracts. Although the gizzard enables poultry to consume moderate amounts of crude fiber, the limit tolerated is low. Poultry require only enough fiber to insure proper movement of food through the digestive tract. This amount should range between 6 and 8% of the ration.

(To be continued)

Livestock Poisoning by Crotalaria Spectabilis

By M. W. EMMEL
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FOR the past 10 years *Crotalaria spectabilis* Roth has been used extensively as a cover crop in the Southern States. It is a legume and grows luxuriantly on poor soils. In recent years the plant has spread from cultivated to uncultivated areas and as a result *C. spectabilis* is found growing wild in many sections of the South. In many areas it grows along roadsides, fence rows and ditch banks.

Observations have shown that the plant is poisonous to cattle, hogs, horses, mules, sheep, goats and chickens under natural conditions. Cases of poisoning have occurred throughout the entire year; more frequently, however, in the early fall when the plant is green and succulent and other forage is dry and unattractive.

Some live-stock men are of the opinion that the plant is not poisonous as animals have been observed in fields in which it was growing abundantly. In some instances they have been known actually to eat the foliage with no apparent harm. Well-fed animals seldom eat sufficient of the plant to induce symptoms of poisoning. It is quite likely that in eating the plant sparingly they may actually develop some tolerance to the toxic principle. Experimental results and field observations indicate that animals do sometimes eat sufficient seed or foliage to cause poisoning. Few animals that show clinical symptoms of poisoning recover. The seed and green, dried or frosted foliage of the plant are toxic. *C. spectabilis* always should be regarded with suspicion in case animals showing symptoms of illness have had contact with the plant.

The toxic principle, monocrotaline (an alkaloid) has been isolated from the leaves, stems, roots and seeds of the plant. The greatest concentration of the alkaloid is found in ripe seeds.

Control of *C. spectabilis* is exceedingly difficult because of the facts that seed may remain in the soil for four years or even longer before germinating, and that the plant reseeds readily. As it is a perennial, it cannot be controlled satisfactorily by mowing or plowing under when in bloom if it was allowed to mature seed the preceding year. Several instances are known in which farmers have been destroying the plant as it has appeared on their farms for the past seven or eight years and are just beginning to make progress toward its complete eradication from their premises.

The symptoms of *C. spectabilis* poisoning

The seeds of *C. spectabilis* contain the highest concentration of toxic principle—it is also found in the leaves, roots and stems

vary considerably in different species of animals. Both acute and chronic cases of poisoning have been observed in cattle. The development of either is dependent, of course, upon the amount of the plant eaten and the period over which it was consumed. Acute cases are characterized by salivation,

depression, incoordinated gait, and icteric discoloration of the visible mucus membranes. These symptoms progressively become more intense. If the animal survives four or five days emaciation occurs. Slight bloat, tenesmus, epistaxis and diarrhea, sometimes slightly bloody, occasionally are

A field of the cover crop *C. spectabilis*

observed. Petechial and ecchymotic hemorrhages are the outstanding gross lesions in acute cases of poisoning. Hemorrhages may occur in any of the visceral organs.

In chronic cases of poisoning, the symptoms may not develop for two to six months after the plant or seeds has been consumed. They include: impaired appetite, diarrhea, bloating, decubitus, and tenesmus, often with partial eversion of the rectum. Marked edema is the outstanding gross lesion accompanying the chronic type of poisoning, the serous membranes of the abdominal cavity, the mucous membranes of the abomasum and omasum, and the subserous tissues of the small intestines being most commonly affected. The intestines appear pale and bloodless. Edema often distends the mesentery to a thickness of several inches. Congestion of the kidneys usually occurs and occasional hemorrhages may be found in the heart. Serous pericarditis and ascites also occur.

Sheep and goats fed *C. spectabilis* experimentally develop lesions similar to those of cattle. The period of illness, however, is usually somewhat shorter.

Acute and chronic cases of *C. spectabilis* poisoning in hogs have occurred frequently. In acute cases the animals may live as long as two weeks. Death often occurs suddenly from gastric hemorrhage. Loss of appetite, unthriftiness and anemia usually are observed. The principal gross lesions are: gastritis, ecchymoses of the endocardium, and accumulations of fluid in the thoracic and abdominal cavities. In chronic cases hogs become unthrifty. Animals on fattening rations fail to make satisfactory gains. Hogs may die from chronic *C. spectabilis* poisoning two or three months after they have ceased to have access to the plant. The outstanding gross lesion is atrophic cirrhosis of the liver. The mesenteric lymph nodes usually are pale and fibrous.

Horses and mules have been observed to die of *C. spectabilis* poisoning six to eight months after contact with the plant. The symptoms do not differ greatly from those described by Stalker as being caused by *Crotalaria sagittallis* Linn in horses in the Missouri Valley and which have been described a number of times in VETERINARY MEDICINE. At first the animal appears to have a gastrointestinal disturbance which the owner often treats for colic. However, the animal is depressed and there is a diarrhea and slight elevation of temperature. Peristaltic movements of the intestines can be heard at a distance of 15 to 20 feet. The mucous membranes of the eyes are congested and icteric. The animal often walks into objects and has no sense of direction or will, pushing against a fence or gate or leaning against buildings hours at a time. One animal was observed to stand with the chin resting on the concrete floor of a porch three feet high and to move his head back and forth in an arc until all of the flesh had been rubbed from the underside of the chin. At times the animal may appear almost normal. Symptoms usually become severe for two or three days every four to six weeks. During these periods the animal occasionally meets accidental death by falling in extremely awkward positions or becoming entangled in fences. Symptoms have been known to occur for as long as a year before death, although three to four months is the usual period of illness. The animal gradually becomes weak and emaciated, and death occurs—a result of cardiac failure.

The gross lesions observed in horses are similar to those occurring in chronic cases of *C. spectabilis* poisoning in cattle. The

stomach usually is found greatly distended with food. The body fat is usually lemon or orange in color. Edema is usually most intense in the mesentery which often is distended to a thickness of one to two inches.

As far as is known there is no cure for *C. spectabilis* poisoning. Symptomatic treatment, while often alleviating symptoms to some extent, has been only of temporary benefit. Only in rare instances have animals recovered, with or without treatment, after having shown symptoms of poisoning.

The seeds of *Crotalaria retusa* L., which is not widely distributed in the South, have been found toxic when fed experimentally to chickens. It is likely that the foliage of this plant is toxic also. *Crotalaria intermedia* Kotschy and *Crotalaria striata* DC. are fairly widely distributed in the South and are considered non-toxic. These latter two species however do not grow as luxuriantly in poor soils as does *C. spectabilis*.

Selenium Poisoning

Certain soils, especially shales are quite rich in an element known as selenium. It is more poisonous than arsenic. Some weeds, usually avoided by animals, always absorb a good deal of this element, while other plants normally not selenium feeders, become so if the soil and weather conditions are favorable, and if so-called "converter" plants have caused an excess of selenium to be drawn to the top layers of the soil. Under these conditions, ordinarily harmless, useful plants and their grains may absorb so much selenium as to become distinctly harmful to animals consuming this material. Thus wheat, corn and barley have been incriminated as plants capable of being converted into selenium carriers.

Prevention consists in carefully guarding animals during periods of drought or sparse vegetation against grazing on areas normally avoided by them. Animals will eat selenium-bearing plants only when other vegetation is not available. Recovery of affected animals, if the poisoning is not too far advanced, usually takes place if wholesome foods supplant the seleniferous material*

*Animal Sanitation and Disease Control, Dykstra, R. R., 1942, pp. 297-99.

Locoweed Poisoning

The most important stock-poisoning plants belong in the group of locoweeds, species of *Astragalus* and *Oxytropis*. At one time the term "locoed" was used synonymously with "poisoned," especially in the western states, and any victim poisoned by eating toxic vegetation was likely to be called "locoed." Indeed there was some difficulty in educating people to distinguish between the true locoism, which is a definite condition, and other types of poisoning such as those caused by the larkspurs and lupines, which are quite different. The locoweeds have been subjected to chemical examination many times and by many chemists during the past 70 years. The earlier studies were described by Crawford (1908). Since that time white locoweed (*Oxytropis lambertii*) has been studied, however the active principle was found to belong to none of the recognized groups of poisonous compounds.†

Crotalaria Poisonous for Poultry*

The seed of the *Crotalaria spectabilis* contains a toxic alkaloid known as monocrotolin which is highly toxic for chickens, quail and doves. These seeds are apparently unpalatable and under ordinary conditions are not voluntarily selected as food. Turkeys apparently are more resistant to its toxic action. Poisoning may occur in either acute or chronic form, terminating fatally in from one day to several months. The presence of the seeds in the crop and gizzard together with the odor of crushed crotalaria leaves aids in diagnosing acute cases, the symptoms of which are distention of the crop, congested comb and wattles and watery discharges from the nose and mouth. In chronic cases, the cyanotic color of the comb disappears and it becomes scaly, feathers become ruffled, and diarrhea and progressive weakness are manifested prior to death. The characteristic lesions described by Emmel** include numerous petechiae in the serous membranes and visceral fat. The liver has a dark brown appearance and is usually mottled. Urates accumulate in the kidneys and ureters.

†*Keeping Livestock Healthy*, 1942, pp. 366-67.

*Diseases of Poultry, H. E. Biester and Louis Devries, 1943.

**Emmel, M. W., 1937. *Jnl. A.V.M.A.*, 90:627.

Johne's Disease of Goats*

By M. W. EVELETH and D. F. EVELETH**
Fayetteville, Arkansas

JOHNE'S disease of goats has received very little attention in the veterinary literature. M'Fadyean and Sheather[1] described four naturally occurring cases and three experimentally produced cases in 1916 and M'Fadyean, Sheather, and Edwards[2] later described two more field cases.

Investigations on the general problem of Johne's disease have been underway in this laboratory for the past three years. During this period the number of goats tested with johnin and examined for lesions and acidfast organisms has been relatively small. Johnin tests reported from here in 1942[3] showed that in two herds of Angora goats studied in survey work approximately 24% of 263 goats reacted to johnin. This report summarizes investigations conducted on five additional flocks of goats that were suspected of being infected with Johne's disease.†

■ In flock No. 1, 15 of 48 goats reacted to the test. On the same farm cattle, sheep, horses and mules also reacted to johnin. This farmer had suffered heavy death losses of both sheep and goats. It was impossible to obtain goats showing clinical symptoms of disease at the time the tests were made. However, two lambs pastured with the goats were killed for post-mortem examination. These lambs were heavily parasitized with lung worms, stomach worms and nodular worms. Acidfast organisms were demonstrated in intestinal smears. Pasture rotation and use of anthelmintics reduced the death losses.

■ Flock No. 2 was composed of 215 goats, of which 48 reacted to johnin and three gave very slight reactions to mammalian tuberculin. The three tuberculin reactors were isolated and later re-tested and gave negative reactions to both johnin and tuberculin. These three animals were then returned to the flock. Four goats from this flock have died from other causes and have been examined for the presence of acidfast organisms and intestinal lesions. In all cases the results have been negative. It was impossible to identify these individuals and it is not known whether they had reacted to johnin previously.

■ Flock No. 3 was composed of grade Angora goats, but because of their inaccessibility it was not possible to conduct a test with johnin. During 1940 and 1941, there were numerous deaths in this flock. Several of the carcasses were brought to the laboratory for examination. All were heavily parasitized and in several instances it was possible to demonstrate acidfast organisms similar to the Johne bacillus. Later the owner culled the flock on the basis of clinical symptoms and sold those showing lack of thrift. Since that time he has not reported any death losses.

Fig. 1. Angora goat suffering from parasitism and Johne's disease

Flock No. 4 was composed of a high producing strain of Saanens. The owner reported that he had lost several animals with emaciation and diarrhea as the outstanding symptoms. Three goats obtained from the

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†The authors wish to express their thanks to Dr. Rebecca Gifford who did much of the preliminary work on this project.

flock were tested with intradermic johnin at the laboratory without any of the animals reacting. These three animals were killed for post-mortem examination but failed to show lesions of Johne's disease. In numerous smears prepared from the intestinal tracts it was impossible to demonstrate acidfast organisms. The owner reported later that he had used anthelmintics and that his death losses had ceased. These cases are so similar to the usual histories in clinical Johne's disease that they are of particular interest. This herd suffered a decline in milk production, emaciation and diarrhea due to gastro-intestinal parasites. The information obtained on this herd bears out the observation that it is frequently impossible, on clinical symptoms alone, to differentiate between Johne's disease and parasitism.

Fig. 2. (Left) Diffuse reaction following injection of Johnin. (Right) Small discreet swelling 72 hours after the injection of 0.2cc of Johnin

■ In flocks Nos. 2, 3 and 4, the symptoms were similar in many respects to those associated with Johne's disease. While acidfast organisms were demonstrated in goats from flock No. 3 all the others were negative and it could not be shown that Johne's disease was the cause of any of the deaths.

The following flock history appears to demonstrate what is apparently a manifestation of a serious infection with *Mycobacterium paratuberculosis*.

■ Flock No. 5 was composed of dairy goats, mostly purebred Alpines. About seven years ago the owner of this flock moved to the premises now occupied. There had been no goats on the place previously. For five years the herd was in excellent health, with no history of illnesses and the breeding record was good. Milk production was maintained at a high standard.

About two years ago, two goats were purchased from an adjoining state. Upon receipt of these animals it was observed that they did not look thrifty; both had diarrhea intermittently and one lost its kid, prematurely, soon after purchase. This goat lingered on for about a year and then died with severe emaciation, diarrhea, loss of appetite and weakness. The other of the two purchased continued to experience diarrhea and did poorly. He was sold late in 1941.

Within six months after bringing these two goats upon the place members of the original flock began to fail. Diarrhea was noticed and, although anthelmintic treatments were given regularly, the animals continued to decline. Towards the beginning of 1942, goats began dying with the symptoms previously described.

August 25, 1942, the first animal was brought to our attention. Up to this time five goats had been lost out of the original herd which had numbered approximately 40.

History of Case 1: Late in 1941, the owner of herd No. 5 purchased a doe locally. This animal had been raised alone within the city. She began to decline in the spring. She gave birth to triplets on July 26, 1942. Immediately after parturition a very severe diarrhea set in and within a week she had stopped lactating, was extremely weak and went off feed. She was down about three days before she died.

Autopsy revealed no parasites present in the intestines or lungs. Most of the internal

organs appeared normal although the ileocecal valve was gelatinous. The ileum and cecum presented a very mild thickening of

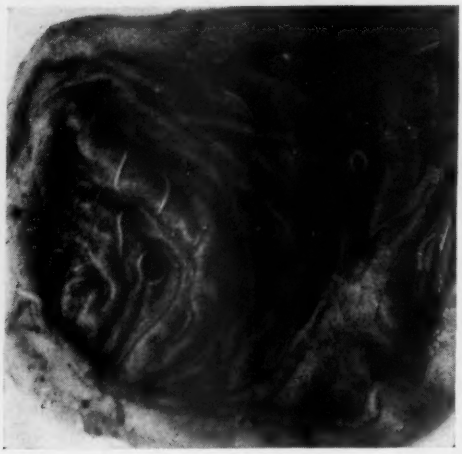

Fig. 3. Cecum from goat in Fig. 1 showing hyperemia and many whip worms

the mucous membrane but with no ridges similar to that usually found in bovine Johne's disease. Acidfast organisms were demonstrated in smears from these organs. A report was sent to the owner but nothing was done until November 31, 1942, when a sick goat was brought to the laboratory.

History of Case 2: This goat, also from herd No. 5, was presented with a history similar to that of case No. 1—intermittent diarrhea and progressive loss of weight. The animal was tested with intradermic johnin and tuberculin and was negative to both. Fecal examination revealed very few lung worm or other parasite eggs, and no acidfast organisms. The goat became moribund and in spite of numerous attempts to revive it, died about 10:00 a.m. the following day (December 9, 1942).

Necropsy: The carcass was extremely emaciated with the skin adherent to the underlying tissues. There was practically no subcutaneous fat, but there was evidence of muscular atrophy. The mouth and head appeared normal; the lungs showed evidence of hypostatic congestion only. There was considerable mucus in the trachea but the lungs were otherwise normal and no lung worms were found. The gross appearance of the spleen was normal. The rumen contained considerable corn and hay; the reticulum, omassum and abomassum were empty except for a small amount of fluid.

There was no evidence of parasites in the abomassum but the crests of the folds of the mucous membrane were deep red with sub-mucous hemorrhages in the region of the pylorus. The liver was slightly cirrhotic; the gall bladder markedly distended, containing about 150cc of bile but the kidneys were normal. There were some small hemorrhages in the mesentery. The mesentery surrounding the stomach was very edematous; the urinary bladder appeared normal; the uterus was completely involuted and the ovaries were in a resting condition. The duodenum presented alternating normal and thickened areas of the mucous membrane, but only in a few areas were there red hemorrhagic crests in the membrane. The remainder of the small intestine appeared quite normal. The cecum contained a few whipworms with some reddened area but no thick folds. The large intestine and rectum appeared normal. There were very few nodules in any part of the intestine. The entire intestinal tract was practically devoid of ingesta, but contained some grayish, viscid mucus.

Slides prepared from the abomassum, duodenum, cecum and mesenteric lymph nodes revealed many acidfast organisms that were indistinguishable from *Mycobacterium paratuberculosis*.

After the autopsy on this goat the owner consented to a johnin test of the flock and an examination of the premises. The barns and corrals are well drained. The animals were fed an extremely well balanced and nutritious diet consisting of a mineral mixture, grain mixture and legume hay. Thirty goats were tested—one buck, 17 does, 10 yearlings and two kids. Very few of these does were pregnant—most of them had not conceived in spite of repeated breedings. Diarrhea, emaciation and a general loss of thriftiness was the common picture.

Of the 30 animals tested, 22—the buck, 14 does, six yearlings and one kid—reacted positively to johnin. The kid which did not

react had diarrhea and was in poor condition at the time of testing. Two mature does, that showed symptoms similar to the one brought to the laboratory, did not react to the intradermal johnin. There were just five of the 17 does lactating and the amount of milk produced was small.

Discussion

The symptoms produced by heavy infestations with gastro-intestinal parasites are so similar to those produced by infection with the Johne organism that they cannot be distinguished by the ordinary clinical methods. Fecal examinations for parasite ova and larvae are a definite aid in the diagnosis but they are of little use in simultaneously occurring Johne's disease and parasitism.

Cattle with clinical Johne's disease frequently pass many organisms in the feces. This does not appear to be the case with sheep and goats. Negative findings obtained when examining fecal smears are of little value in the diagnosis of Johne's disease in either sheep or goats.

The intradermic johnin test is of limited value in the diagnosis of advanced cases of Johne's disease. In several cases with cattle, and sheep and the one goat described here, the animals have failed to react with a swelling but have developed a severe diarrhea, following the intradermic injection of johnin. The cause and significance of this reaction is not known.

Poor reproduction in herds and flocks in which there are numerous clinical cases of Johne's disease is common. We have pointed this out in a previous publication [3] but it is perhaps worth while to stress this point further. The symptoms of poor reproduction may be failure to conceive. This appears to be due to loss of fertility in either the male or the female.

Reports of abortions are not uncommon in sheep and goat flocks showing other clinical symptoms of Johne's disease. The incidence of weak kids and lambs is high in Johne's disease infected flocks. These symptoms have been associated with Johne's disease in sheep, cattle and swine in reports published previously.[2, 4]

These studies have not progressed far enough to say definitely that there is congenital infection in this disease. It is a frequent observation, however, that the offspring of animals infected with Johne's disease almost always react to the johnin test.

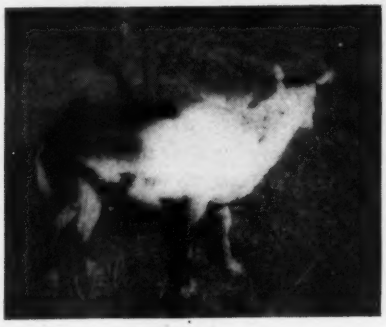

Fig. 4. Mature male suffering from Johne's disease. Note the tucked up flank and emaciated appearance

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Just how an infecting agent causes a specific disease, what changes occur, where these changes are initiated, the nature of the resulting products and their influence on the physical and chemical process underlying the normal cellular activity of the animal; are questions which must be answered before chemotherapy can be highly effective in relieving man of the many ills that now reduce his efficiency, limit his usefulness and endanger his life. — *M. E. Crossley.*

★ ★ ★ BUY WAR SAVINGS STAMPS AND BONDS

Clinical Aspects of Vitamin B_1 Deficiency in Dogs

By J. W. PATTON
East Lansing, Michigan

FOR a number of years the writer has been interested in the clinical manifestations of vitamin B_1 deficiency. In fact it was this interest in the disease, as it is met in practice, that led to the research into vitamin B_1 deficiencies reported[1] some years ago. In that report it was pointed out that for some unexplained reason it appeared necessary to give the vitamin B_1 by injections for several days in succession to insure recovery. This appears to be even more necessary in treating clinical cases than it is in cases induced experimentally. Apparently it is necessary to get the animal into a state of B_1 equilibrium before the organism can utilize the normal requirement of this vitamin to advantage. In other words the nervous equilibrium of the animal suffering from B_1 deficiency must first be stabilized before a normal response may be had to the injection of thiamin. In many of the severe cases occurring naturally this cannot be attained by a single injection. Usually cases which closely resemble encephalitis fail to respond to the initial injection. Some of our earlier cases were lost because, when what appeared to be B_1 deficiencies did not respond to thiamin injections as experimental cases do, the diagnosis was changed to encephalitis and the administration of thiamin discontinued.

The following cases illustrate the failure of field cases to respond to thiamin with the clock-like regularity exhibited by experimental cases:

1. A seven-year-old male beagle had a history of having had fits or convulsions, at least one every hour, for the preceding 24 hours. It was just emerging from one of its epileptiform convulsions when presented for treatment and was in a semi-comatose condition. It was moaning, or howling slightly and appeared to be in great pain. A tentative diagnosis of vitamin B_1 deficiency was made on the symptoms and history.

A hypodermic injection of 1000 units of vitamin B_1 was prepared but before it could be given the animal suffered an epileptiform seizure or convulsion which the owner said was quite typical of all the others. The animal drew its head to the side, champed its jaws, salivated markedly, became rigid, started to howl and struggle, and went through the motions of running but was restrained by the owner. The customary injection of 1000 units of vitamin B_1 was given and the animal was returned to its home with the instructions that changes in its condition should be reported. Within two hours the owner telephoned that the animal had had several more convulsions as severe as those before. He was instructed to bring the animal to the office for additional treatment. A capsule containing 1½ grains of nembutal was given immediately, *per os*, with the result that the animal was quiet for the next 12 hours. The following morning the patient seemed to be somewhat improved, at least the owner reported that the convulsions seemed to be less severe. There was doubt as to whether it was the nembutal or vitamin B_1 which was having the quieting effect. The owner observed that the seizures coincided with the crying of a small baby in the household. This is an illustration of the effect of any disturbance on this nervous ailment. It was directed that the animal be removed immediately to other quarters.

This case presented all the symptoms of vitamin B_1 deficiency; yet an initial injection of 1000 units of thiamin apparently did not control the convulsions. As has already been shown[1] in experimentally induced cases of B_1 deficiency, the symptoms unfailingly subside four hours after they are given a dose of this size. This animal was given a second injection of 1000 units of thiamin and by evening, of the day following the attack, had eaten the first food in several days and appeared to be much improved. No sedative was administered during the second day. The morning of the

[1] Patton, John W., 1938. Fright-disease an avitaminosis. VETERINARY MEDICINE, 34:6, pp. 372-381.

third day the animal again was given 1000 units and by evening of that day it was normal.

This case is typical of many uncomplicated cases of vitamin B_1 deficiency in that it failed to show improvement after the initial injection of vitamin B_1. In our earlier work we were mislead in several of these cases and changed the diagnosis to encephalitis. All such died. The point is, in practice, there are many cases of vitamin B_1 deficiency with severe convulsions in which the initial injection of thiamin does not bring relief. Possibly the heightened metabolism or the extreme output of energy, caused by the frequently repeated epileptiform seizures, depletes the vitamin B_1 so rapidly the initial injection is exhausted within a few hours. Perhaps an initial dose of 3000 units should be given in such cases. There is a further possibility that the animal, due to extreme nervous excitement combined with the tremendous amount of energy expended in the convulsions, is wasteful of the initial injection of thiamin. This hypothesis is supported by the following case:

Lack of only one vitamin occurs so rarely in man that physicians, even while treating gross lesions of one avitaminosis, commonly supply liberal amounts of all other vitamins simultaneously.

A thirteen-year-old French poodle was presented for treatment with a history of having had convulsions for the preceding 24 hours; recent ones occurred every 20 to 30 minutes and, as the convulsions lasted for 5 to 10 minutes, the animal was in a precarious state of exhaustion. The owner lead the animal by a noose on a pole, he was so fearful that his pet would bite him. Examination revealed the animal to be exhibiting typical symptoms of vitamin B_1 deficiency and such was the diagnosis.

An injection of 1000 units of vitamin B_1 was given immediately and the animal was placed in a cage for observation. Within the next four hours it had ten convulsions. Vitamin B_1 injections apparently were not going to work in this case and on that ground a tentative diagnosis of encephalitis was made. Notwithstanding, the change in diagnosis a second injection of 1000 units of thiamin was given 4½ hours after the first. For another two hours the animal continued to have convulsions which became, however, less severe and passed off more quickly. The following morning the animal appeared to be decidedly improved and was eating, however, there was unsteadiness and apparent weakness. The only definite symptom of vitamin B_1 deficiency was clamping of the jaws and turning the head to the side slightly. A third injection of 1000 units of B_1 was given and the following day the dog appeared to be normal.

Case No. 3. A two-year-old collie was presented, of which the owner related a history much the same as cases No. 1 and No. 2—convulsions, ineptness and periods of excitability. This case was referred by a practitioner who had diagnosed it tentatively as encephalitis and recommended destruction to which the owner would not consent. This case being well developed, with convulsions hourly or oftener, injections of vitamin B_1 were given three times the first day. Recovery was complete 24 hours later.

The procedure necessary for recognition of nutritional failure is a combination of nutritional history, medical history and physical examination, including such special examinations as may be necessary.

In these severe cases there is an advantage in giving a sedative at the time of the initial injection of thiamin. Under the most favorable circumstances there will be little improvement in them for about four hours and often not for a longer period, as is illustrated by the cases reported in the foregoing. In the meantime the animal may be injured in some of the convulsions or may

die in them. We have had death occur on several occasions before the thiamin had time to restore the nervous equilibrium or make up the deficiency. In any case the owner is distressed by the suffering of the animal. It is essential to make certain of the diagnosis before giving the sedative since this agent masks the symptoms completely and the tendency would then be to give less than an adequate amount of B_1.

It is not surprising that difficulty should be experienced in differentiating B_1 deficiency, fright disease or hysteria from encephalitis since, as Professor Ivy was the first to point out, there is an encephalitis present in this condition as shown by a blush on the meninges on necropsy. It is a true non-infectious encephalitis—mild, but acute.

The preclinical states of vitamin deficiency in which tissues are depleted and the physiology altered in some degree are more frequent than the anatomical lesions of frank deficiency. The neurasthenic symptoms are the first to appear in any vitamin deficiency.

The cases reported in the foregoing were cases of simple vitamin B_1 deficiency, i.e., they were uncomplicated. Although it lays me open to the charge of reiteration, I would again point out that not all cases of vitamin B_1 deficiency met in practice are without complications. Most cases of fright disease, hysteria or running fits are essentially vitamin B_1 deficiency. This has been demonstrated beyond any question in controlled experiments over and over. No amount of negative findings can weigh against this positive evidence. Experimentally this condition can be produced at will, and the onset can be predicted almost to the hour. It can be cured with equal certainty and even greater precision as to time by a single injection of thiamin. However under natural conditions vitamin B_1 deficiency is prone to complications. If it develops slowly, in contrast to the sudden onset that may be precipitated in experimental animals, the interference with the appetite over a considerable time tends to insure other vitamin deficiencies also, particularly vitamins A and C. Any condition that increases the temperature of the dog increases the rate at which B_1 is used up by the body. If at the same time the appetite is in abeyance, as commonly occurs in infections, the stage is set for B_1 deficiency.

In such cases the critical factor—the emergency—is the B_1 deficiency. That must be relieved first of all. But a thiamin injection does not relieve a vitamin A deficiency nor a niacin deficiency nor the need for vitamin C. Nor does it lessen the urgency for treating distemper, if the animal be suffering also from that infection, nor for taking the usual measures if the primary disease be rabies, nor for appropriate treatment of any other condition that may complicate the B_1 deficiency, or which the latter may complicate.

Of the hundreds of cases of nervous ailments in dogs which the writer has treated in the past few years, the vast majority were either cured or materially improved by the administration of B_1. Many of these cases had failed to respond to other lines of treatment. Some were referred to me by other veterinarians. A good many others had been pronounced incurable and euthanasia advised yet when the B_1 deficiency was relieved and the complications, if any, treated, recovery was prompt in most cases.

B_1 deficiency is basically responsible for the vast majority of nervous symptoms in dogs. It is almost certain to be a complicating factor in prolonged digestive upsets and in distemper and other acute infections. We don't wait for hysteria or fright disease to develop but administer it when the prodromal symptoms warn of the approach of serious nerve disturbance.

To the veterinarian, as to the physician, B_1 is the vitamin that must be constantly available if good health is to be maintained, the vitamin that is poorly stored and, therefore, must be included in the daily diet, the vitamin the need for which is increased by a heightened metabolism or an increase of carbohydrates in the food.

An Opportunity for Rabbit Breeders

By GEO. S. TEMPLETON*
Fontana, California

THE present meat shortage, which is acute in some regions and which may become general, is focusing the attention of the public on the good qualities of domestic rabbit meat. Fortunate is the family that has facilities to care for three or four does and a buck to supplement the family meat supply.

The raising of rabbit meat is a patriotic duty because every pound that is produced will release a pound of some other meat for our armed forces or for export to our Allies. Every breed of domestic rabbit can make its contribution to the meat supply and every breeder should endeavor to stimulate rabbit meat production in his home community and to supply prospective breeders with good stock.

With the scarcity of meat for civilian consumption, the unrestricted use of so valuable an edible animal as the rabbit for pregnancy tests when either the mouse test or the frog test is a satisfactory substitute seems wasteful. Upwards of 1,000,000 more pounds of rabbit meat could have been available for food in the past year had the frog, rat or mouse been used for these pregnancy tests. At least, for the duration of the war, it would seem that such use of rabbits should be prohibited since there are suitable substitutes.

During January and February alone over 22,000 pieces of mail requesting information on rabbit production problems were received at the U. S. Rabbit Experiment Station at Fontana, California. A large percentage of these included a request for information as to sources of breeding stock. At the present time the lack of breeding stock is the bottleneck of an expanded rabbit production program. During this spring season with its heavy production, all breeders should select and save every junior doe and buck that promises to make a good breeding animal. He should then let it be known that he has good stock for sale.

*Director U. S. Rabbit Experiment Station, Fish and Wildlife Service, U. S. Department of the Interior.

Sexing Very Young Rabbits

Many times it would be profitable for rabbit breeders to sex very young rabbits. Dependable information on this subject would be especially useful to breeders with a market for breeding or laboratory animals.

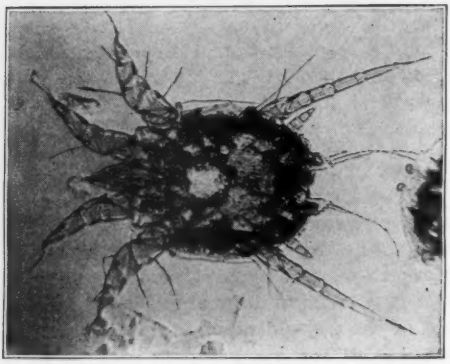
It is possible to determine accurately the sex of the day-old rabbit but it is easier to distinguish the sex at three days of age. It is, therefore, a good plan to sex the litter and destroy the surplus on the third day.

The external organs of both sexes of the newborn rabbit have very much the same appearance and a special technic is required for identifying the sex at an early age. Good eyes and light are necessary. In order to prevent the persistent wiggling of the small animal, it must be restrained firmly, yet gently. Place the little rabbit on its back in the left palm with its head extended towards the heel of the hand, using the index finger to press the tail back and down and the thumb of the left hand and index finger and thumb of the right hand to manipulate the sex parts. Press down on the sexual organ gently but with sufficient pressure to expose the reddish mucous membrane. In the case of the buck, the mucous membrane can be made to protrude sufficiently to form a circle; in the case of the doe it will protrude and form a slit that will have a slight depression at the end next to the rectum.

If one has had experience in sexing young at weaning time, it would be a good plan to practice with several at about three weeks of age and with this added experience it will be easier to sex the three-day old rabbits. Sexing should not be practiced on the same animals at short intervals because the repeated irritation of the tender parts may be detrimental.

Ear Mange or Ear Canker

Breeders have found ear mange or ear canker in domestic rabbits quite common, in fact it is prevalent all over the United States, as indicated by the numerous requests for information on the subject received at the U. S. Rabbit Experiment Station. This trouble causes considerable loss since affected animals fail to make satisfactory gains, breeding animals lose flesh and may refuse to breed and, in the more chronic cases, death occurs.



Female of *Otodectes cyanotes* var. *cunniculus*, the ear mite of the rabbit.

This condition is due to a mite that infests the ear, causing irritation which results in scabs being formed at the base of the ear and within the external auditory canal inside of the ear. The rabbit gives evidence of infestation by shaking its head, flapping its ears, and scratching them with its hind foot. Treatment is very simple and effective. The affected parts of the ear should be treated with a mixture of one part iodoform, ten parts ether, and twenty-five parts olive or cottonseed oil, applied with a cotton swab. If a large number of rabbits need treatment, an efficient and time-saving method is to apply the mixture with a small oil can. In seven days the loose scabs should be removed and another application of the mixture made. Applications should be repeated at seven-day intervals until the ear tissue is healthy.

If a thorough job is made of the chore and all of the mites in the herd of rabbits are destroyed, there will be no new cases of ear canker until more mites are brought in by other rabbits.

Price ceilings which were effective March 1 were set on live, tame rabbits by the Office of Price Administration. No breeder is permitted to sell live rabbit for food for more than 24 cents per pound—the price for colored rabbits is 22 cents. Dressed rabbit may not be sold for more than 44 cents per pound wholesale and 55 cents retail.

* * * *

The backyard industry of raising rabbits can turn out thousands of pounds of meat—meat that is sorely needed. Domestic rabbit is delicious and nutritious, and not too hard to raise. It takes sensible breeding and brooding, careful choice of stock and work just as it takes all of these to raise any livestock or poultry. Delicately flavored and almost as white as the breast of chicken domestic rabbit is, by government test, the most nutritious of the common meats. Rabbit breeding is a serious business with real opportunities. The rules are simple: good, healthy stock; clean airy hutches; clean wholesome feed.—Excerpts from *Prairie Farmer*.

Impotence in Rabbits

This condition appears to be most common in certain breeds, the larger animals, at present in demand for crossing purposes, being most frequently affected. The commonest picture presented is that when a doe in season is put to an affected buck he will mount and appear to be about to serve her. He loses interest, however, just before the doe is ready to accept service, dismounts, and proceeds to pull her about. This process may be repeated several times with the same doe, coitus never occurring. More pronounced cases do not even attempt to mount and will either pay no attention to the doe or will pull her about and bite her.

Preliminary investigations have been carried out and encouraging results obtained following the injection of gonadotrophic hormone prepared from pregnant mare serum. Only a very limited number of rabbits has been available and more are required, so that the efficacy or otherwise of this line of treatment may be established and, if effective, the dose of serum computed.—*Vet. Rec.*

Autobiography of a Veterinary Practitioner

By E. T. BAKER, Moscow, Idaho

XVI

Other Lines of Practice

BEING in general practice gives a chance for several side lines, to be wedged in between regular calls and help increase the total income. While, of course, there are many of these, I will mention a few I handle in connection with my country practice:

State Work

As a deputy state veterinarian, I receive $6 per day for services, and 5c a mile for my auto. From five to ten days a month are spent in making disease investigations, interstate inspections and the like. The only two advantages this position offers are the ready cash each month and the wider contacts one can make.

Federal Work

I had several years of per diem work at Bang's testing and, with the exception of replacing eversions and handling dystocias, I have never worked so hard in my life. In my county there are about 1650 cattle owners, with around 15,000 cattle. Most of these are wild and woolly and many of them had to be lassooed and snubbed to a post for bleeding. Testing cattle in a modern dairy barn is not laborious and one can bleed fifty or sixty in a short time. On account of the local practitioner being available to test cattle when the owner is ready, it would be desirable to have him do retesting of infected herds. With a little more cooperation on the part of the federal authorities, much good could accrue from such an arrangement. Just how calfhood vaccination is going to pan out remains to be seen.

City Work

City meat inspection makes a nice cash addition to one's monthly income. This subject has been so thoroughly covered in three articles appearing in VETERINARY MEDICINE—May and November, 1939, and March, 1940—that no further mention need be made.

Farm Journal Queries

I also answer the veterinary queries for a farm journal with a circulation of around 140,000 subscribers. Last year over 1200 queries were answered. For this service I receive a monthly salary. I should judge it takes about five or six hours a week for this work. Being able to handle a typewriter helps in this "side line." About 90% of the owners are referred to their local veterinarians, and in the others, simple lines of treatment suggested.

Competition

Competition is a serious problem and very unfortunate when more veterinarians are located in one community than are needed, or the business justifies. As this is a free country, there seems to be no method of making proper adjustments, although much might be done to equalize the practitioners. There are many locations that would support a man, but who are without one.

My own experience along this line has not been unusual. Since I have been here twenty-nine years, probably half a dozen men have located here, with several vowing to "run me out quick." Every kind of artifice was used, from bribing 'phone girls to furnishing free drinks during prohibition days. Fees were slashed and, I am sorry to say,

one university professor was one of the worst offenders in "bootlegging" practice, as he was supposed to be paid by the state. However, as I was out of debt, and paid no attention to "knockers" but pursued the even tenor of my way, they have all disappeared. At first, they were quite busy doc-

Testing cattle for Brucellosis in modern dairy barns and yards is not laborious but most of the cattle in my county are wild and woolly and have to be lassoed and snubbed to a post for bleeding

toring for some of our leading deadbeats. They flew around over the country hither and yon, offering to do work at ridiculous prices. People became skeptical, and came to me for their supplies and services as usual. I merely smiled and refused to knock them or get "all het up."

Agricultural students sometimes imagine themselves to be God-anointed "vetinaries." Did they not receive a course in "vetinary science" and learn how to use the needle? Pay no attention to these little boys. They will soon learn otherwise.

In every neighborhood, there is always a "handy man." He may be equipped with a dose syringe, injection pump, hypodermic needle and a balling gun. He merely helps his neighbors in a pinch, without charge. At first, he is quite active, but he soon loses his youthful vim and vigor. Instead of fighting this kind of fellow, cultivate his acquaintanceship, and do him a favor. Pretty soon he will be sending a lot of work to you. That has been my experience, at least.

Patent medicine vendors representing several well known companies prowl around our country as they do almost everywhere else. They sell a certain amount of "dope" but, in my community, not as much as they used to. When stock owners find they can get better "stuff" from the local veterinarian at a reasonable cost, they will come to him.

County agents were formerly more active along veterinary lines than they are at present, at least this is the case in my section. They are so busy handing out wheat checks and throwing the bull in general, they do little doctoring any more.

Then, of course, there is the stock owner who "rode around with the state vetinary of Nebrasky" when he was a kid. He is an expert on all diseases, ranging from holler horn to wolf in the tail. He "kin cure bloody murrain" with just one dose of his favorite mixture, the formula of which has been handed down from Grandpappy, who came from Arkansas. When I am called to treat an animal owned by one of this type, I consult with him very earnestly, and concur with him in every particular. If there are by-standers present, or a hired man, I tell them he has diagnosed the trouble correctly, and I only regret I have not had the long experience he has evidently had. This causes his manly chest to rise and swell with pride, and when I leave he proudly declares: "Doc sure knows what's what." Later I get calls that can be traced to him.

Some farm women also have a "gift" for doctoring animals, and when they tell me

what to do, I always look surprised, and ask them how they happened to be so well informed on the subject. They tell me their talent is just inherited and they cannot help being a good doctor as well as nurse. I ask them how they prepare milk to feed orphan pigs, and often jot it down in my note book for future reference, and this makes them feel so good they may give me a chicken for Sunday dinner, or a big roll of yellow butter just out of the churn. Now, I am far from being a "ladies' man," but I do know the female sex is not entirely invulnerable to a mild form of Irish blarney. When the farmer's wife thinks you are all right, you *are* all right. Practically every husband is boss around the house when his wife is away visiting.

Then, of course, there are the dear relatives who happen to be visiting on the farm when an animal gets sick. They step in and take entire charge. One of the most difficult problems to decide is when two of these relatives disagree as to the exact nature of the ailment and they "leave it up to Doc." Here is where diplomacy of the highest order is required. Perhaps Uncle Zeke claims the horse has bots, but Grandpappy vigorously disputes this diagnosis and says its his water. My usual strategy is to get both men so busy leading or holding the patient, or mixing up an enema they forget all about the burning question. Then, after it is over and I am driving back to town, they may look at each other and say:

"Well, I'll be durned ef Doc said just what it was!"

When the hired man calls me out to see a sick animal and the owner is absent, but returns before I leave, I tell the latter if it had not been for the hired man's good judgment, he would be shy an animal. This, of course, makes the hired man not hate me, for the owner treats him pretty respectfully after that. Or, if a neighbor happens to find a horse tangled up in the barbwire and calls me, I tell the owner he had better give the neighbor a cigar for saving his animal. All these little things come under the heading of "Psychology of Practice." I am not much of an expert on this, but do fairly well as an amateur.

Extra-Activities

Living in a small town, one can become so mixed up in various activities he will find very little time to attend to his own business, or to have time for healthful recreation and leisure. I figure I spend about eight hours a day, seven days a week, attending to my practice, city meat inspection, state work, answering veterinary queries and the like. Then, there are my supplies to replenish; equipment to keep in good order, and often days when I am busy from early morning to late at night in practice.

Years ago, I found that I would have a little trouble to keep out of too many organizations, worthy as they may be. Perhaps I have spent more time and effort in the Elks lodge, as I have been the editor of their monthly bulletin for over twenty years. Also, I have made out all bowling schedules for our tournaments, and have been on our bowling team for more than that length of time. We bowl one night a week from October to March, and usually have one or two out-of-town matches a month. I have been a member of the Masonic lodge for nearly thirty years, but have not been to lodge for nearly twenty of them. The only other organizations I belong to are the Grange, A.V.M.A., and Idaho state veterinary association. When the Rotary, Kiwanis and Lions clubs were installed I was invited to

The author was presented with a diamond emblem ring on account of his good looks (so he says) at the 50th anniversary celebration of the Moscow Elks early in January. Another member was given a like present on account of his *interest* in the lodge. The author has been editor of his lodge bulletin ever since it was started—24 years ago.

belong to each one of them, but did not feel I had the time to devote to their activities. I have a professional membership in our local chamber of commerce, but take no active interest in it. My wife and I contribute a small sum to one of the churches, but we do not belong or engage in their activities. My wife is quite active in bridge circles, and belongs to several clubs, as well as to the Eastern Star.

As to politics, many practitioners like to be classed as "rock-ribbed Republicans" or "Unterrified Democrats." Personally, I have never voted a straight ticket in my life, so far. I choose the candidates I think will make the best officers, regardless of party. In the county, my ballot is quite mixed up. I have never had any desire to hold public office of any kind, and would not run for one on a bet. I doctor animals for all kinds of people of every kind of political and religious faith and I respect their opinions, but keep mine to myself. I have been a deputy state veterinarian under all kinds of administrations and, with one exception, have been treated very fairly by all our state veterinarians. My position of city meat inspector is non-partisan.

Reading constitutes one of my principal forms of recreation. I like to read anything from the various magazines, monthly bulletins to all kinds of fiction, history and detective yarns.

Fewer veterinary instruments are sold as compared to twenty-five years ago. The same conditions arise in practice year after year and when one has a few durable instruments he finds he can get along with them. Old time practitioners often had a thousands dollars worth of equipment, mostly in glass cases for the petrified public to look at. "Gosh, Doc must be a smart guy to know how to use all them tools," the awe-stricken spectators would whisper.

Last but not least is the home life of the practitioner. If he has a normal pleasant home with an agreeable wife and children that are a credit to them, then he is indeed fortunate. Having been married to the same wife for twenty-eight years to the day as this is written, I know nothing of divorce. I remember the first divorce in our county. People talked about it in hushed whispers. It was regarded in the same light as a sensational murder. Today, all that is changed. If two people cannot agree on everything, they "split the blanket" and try it all over again.

(*To be continued*)

No Loss of Vitamin A

Since such tremendous quantities of eggs are being dried for shipment to our armed forces and for lend-lease, it is of interest to note that the Purdue Experiment Station, after extensive tests, announces that the results of biological assay indicates that little or no deterioration of the vitamin A content took place during dehydration.

Plants Fabricate Vitamins

The worth of most of the vitamins was first proved for animals, and it was not till many years later that it was found that plant tissues which supply these vitamins actually fabricate them for their own needs. However, three vitamins—inositol, pantothenic acid and biotin—were first recognized as growth substances for plants nor were they tried on animals till years later. —*Sci.*

Effect of Ration on Utilization of Vitamins

A deficiency of vitamin B_1 may cause a condition in poultry resembling Chastek paralysis in foxes, reports the Wisconsin Experiment Station. It has been determined that raw fish contains a substance which either destroys vitamin B_1 or interferes with its utilization and that the disease seems to occur only when such fish makes up a considerable part of the ration. Likewise chickens may be deficient in vitamin A even though fed sufficient quantities of carotene, because certain types of meat, dried milk and dried fish products destroy this pro-vitamin in dry contact, is the report from the Texas Experiment Station. If meat scraps are autoclaved their carotene-destroying power is removed. The presumption is that the enzyme responsible for the destruction of carotene is thus rendered ineffective.

Ictero-Anemia in Growing Swine

By ARTHUR D. ROBB
Wamego, Kansas

A NEW disease of growing swine characterized by icterus and anemia has appeared in the Middle West. It seems to be increasing and has been reported as quite a problem in several localities in Kansas during the past summer. Kinsley[1] in 1932, made the first report of this condition. Doyle[2], later in 1932, also reported the disease. Since that time, articles have been written by Kinsley and Ray[3], Dicke[4], Quin[5], Kinsley[6] and Spencer[7]. Symptoms and post-mortem findings, described by these writers, are quite in agreement with those which we have come to associate with the disease. We have been unable, however, to confirm the previous reports concerning the probable etiology of the disease. This statement is made following considerable work in attempting transmission to healthy pigs. In the course of this work, careful study was made of the blood picture as shown by total R.B.C. counts, sedimentation rates, and microscopic examination of blood smears stained with Wright's stain.

Symptoms.—Depression is the first clinical evidence; early rise in temperature usually described as 104 to 106° F., however, several temperatures as high as 107.6° F. have been observed. The temperature falls with the progress of the disease and is often subnormal some time before death. Dyspnea is usually a symptom with "thumps" being fairly prominent although no congestion of the lungs is found on post-mortem examination. Weakness, rapid shrinkage and pallor of the visible mucosa followed by icterus is always a symptom in chronic cases. In acute cases icterus may not develop.

Post mortem.—Outstanding lesions are: generalized icterus, thin blood, markedly enlarged spleen, yellow-stained liver, bile-stained intestinal mucosa and a gelatinous golden-brown bile in the gall bladder. Variations of these typical lesions will be found depending upon the chronicity or acuteness of the disease. An acute case—death in 48 hours, or less, from onset of symptoms—may reveal nothing more than thin blood, slightly enlarged spleen, gelatinous bile and bile stained intestine. In the more chronic cases—four days to a week—hydrothorax, hydro-pericardium and ascites may be present. As with all else, this fluid is yellowish in color. The intestinal contents and often the stomach contents are discolored by the deeply staining bile. In the uncomplicated cases, constipation is the rule. "In lingering cases, a scurvy-like condition has been described occasionally[3]."

Blood picture.—Total R.B.C. counts are usually 2,000,000 or less. Total W.B.C. counts are not ordinarily affected and are about a normal 11,000. In the early stages of the disease normoblasts are quite prominent on smears but are less noticeable later. Sedimentation rate is invariably fast. (See charts.) Sedimentation is practically completed in 30 minutes or less as compared to several hours in normal swine blood. Doyle[2] mentions the red cells showing spontaneous agglutination and, while it was not constant, I have observed it on several occasions. The blood appears thin and watery, but the clotting time does not seem to be changed. The serum is tinged a yellowish color.

Age incidence.—We have seen this condition in growing pigs weighing from 30 to 175 pounds. Kinsley[3] has stated that it may occur at other ages.

Clinical course.—The clinical course ranges from 30 hours to 10 or 12 days, the average being about four or five days. Mortality is quite variable, but under average farm conditions it is quite high, in visibly affected pigs. In herds it may range from 1% to 30%.

Microscopic lesions.—Apparently the only report on this part of the pathology is that given by Spencer[7]. He reports—"A section was made of the spleen and of the liver of an affected pig and stained with hematoxylin-eosin. Histological lesions of the spleen consisted of a hyperplasia of the reticuloendothelial cells, hemosiderosis and congestion. The liver lobules showed a marked central atrophy in which normal liver cells were replaced by degenerated and broken-down erythrocytes, pigment granules and various phagocytes which had ingested the debris. In addition the liver showed hemosiderosis, an infiltration of the interlobular spaces with lymphocytes and macrophages and albuminous degeneration of the hepatic cells."

Etiology.—In view of our work just completed, we can say nothing more than—unknown. Earlier writers, almost without exception, have stated—sometimes rather glibly—that examination of blood smears revealed protozoan or anaplasma-like bodies in the red blood cells. Kinsley[1] first reported this and then Doyle[2] stated, "Blood smears stained with Giemsa's stain showed the presence of bodies, evidently organismal in nature, within the red cells. These bodies showed considerable variation in morphology. Some were coccoid, some bacilliform, while still others were ring-formed. The ring-formed bodies often showed small chromatin knots or masses at certain points on their circumference." A photograph accompanied his article illustrating his description. In our study of stained blood smears, such structures were seen but by careful focusing and light adjustment the conclusion was made that they were actually artifacts produced in the process of smearing, staining or drying. This belief is intensified by the finding of these structures in smears of normal blood as often as in blood smears from affected pigs.

TABLE I — PROCEDURE

Pig. No.	Date Inoculated	Route of Inoculation	Amount Used	From Pig No.	R.B.C. of Normal	R.B.C. of Infected	Temperature of Normal	Temperature of Infected
5	9-30-42	Intravenous	5 cc.	1	6,000,000	4,000,000	103.0°F.	102.0°F.
6	10-1-42	Intraperitoneally	2 cc.	3	7,850,000	811,500	102.4°F.	103.2°F.
7	10-5-42	Subcutaneous	11 cc.	2	4,700,000	3,600,000	102.8°F.	102.0°F.
5	10-9-42	Intraperitoneally	12 cc.	4	6,100,000	2,900,000	102.6°F.	106.4°F.
7	10-14-42	Intraperitoneally	17 cc.	4	7,500,000	2,100,000	102.1°F.	104.8°F.
9	10-16-42	Intravenous	10 cc.	4	5,250,000	900,000	100.8°F.	101.2°F.
10	10-17-42	Intraperitoneally	43 cc.	3	5,000,000	6,500,000	101.7°F.	102.8°F.
8	10-19-42	Contact Lice	—	4	7,300,000	1,450,000	102.6°F.	102.0°F.

Note: Infected pigs are numbered 1 to 4 inclusive. Normal pigs are numbered 5 to 10 inclusive.

Howell-Jolly bodies and normoblasts further complicated the picture. Workers with anaplasmosis of cattle quite generally agree that these are often mistaken for Anaplasmae by the unskilled examiner. That Anaplasma bodies were not present in the blood of the four affected pigs which were the basis of these studies, we are certain.

Transmission.—The mode of transmission is unknown. Indeed, it cannot even be said that it can be transmitted. Until now, these statements by Kinsley and Ray[3] are all that has been known. "We have made one unsuccessful attempt to transmit the disease to healthy swine by injection of two- or three-day-old blood. It is probable that the disease can be transmitted by using freshly drawn blood."

With this statement in mind, five sick pigs, weighing about 30 pounds, were obtained from a herd which had been receiving treatment. These animals had been sick from two to five days. Two of them were

sacrificed for post-mortem examination at the veterinary clinic of the Kansas State College. Total R.B.C. counts were 2,150,000 and 1,250,000. Post-mortem examination revealed typical lesions of ictero-anemia, or as Kinsley[6] has written, "For want of a better name, this condition has been called 'anaplasmosis-like' disease of swine." The three remaining pigs were taken to the Veterinary Research Laboratory of the college. Here daily temperatures were taken and frequent total R.B.C. counts and smears were made and sedimentation rates for a period of six weeks were noted. A fourth pig from the same herd was added about two weeks later. This pig had been visibly sick less than 48 hours when obtained.

Three healthy pigs were secured at the beginning and three more at the time the fourth sick pig was added. Transmission was attempted by direct inoculation and indirectly with lice (*Hematopinus suis*).

Procedure.—This is given in Table I.

Results.—No. 5, No. 7 and No. 10 at no time showed, clinically, any variance from normal by temperature rise nor by change in total R.B.C. counts.

No. 6 showed a temperature of 105° F. on October 2, but no clinical evidence of illness. On October 3, the temperature was 104.9° F., the total R.B.C. count had dropped from 7,850,000 to 5,550,000. In addition pig No. 6 had an arched back; a drawn, tired facial expression; was slightly gaunted; some degree of anorexia and an increased rate of respiration. On October 4, clinical symptoms had disappeared and the temperature was again normal. On October 6, the total R.B.C. count was 4,550,000. By October 10, the total R.B.C. count was again near 7,000,000. This cannot be considered a transmission because of:—the short course, the insignificance of the lowered total R.B.C. count and the lack of pathognomonic symptoms.

No. 9 showed no evidence of illness save for a rise in temperature to 104.4° F. on October 19—three days after inoculation.

No. 8 was the contact pig for No. 4. No. 8 was practically free of lice at this time while No. 4 had a heavy infestation. On October 22, No. 8 had a temperature of 105.5° F. and showed some depression. The total R.B.C. count was 5,750,000 that day. The next day the temperature had returned to 103.8° F., but this pig lay down most of the time and the total R.B.C. count was 5,450,000. For the next two days this animal showed some evidence of depression, but temperature and total R.B.C. count remained constant. This could not be termed a transmission. The clinical symptoms shown can probably be explained as the result of the sudden heavy infestation of lice, to which this pig was subjected.

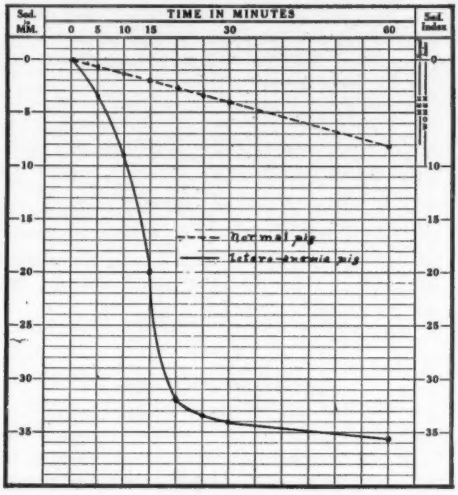


TABLE II—BLOOD SEDIMENTATION CHART

Transmission of the disease from sick to healthy pigs by direct means and by indirect means was not successful. Attempts were made to transmit the disease from animals which had just broken with the disease and from those which were recovering.

Treatment.—Treatment is symptomatic. Affected pigs should be placed in well-bedded, small quarters which are draft free. They should be supplied with laxative feeds and plenty of fresh water. Iron preparations may be given. Arsenic preparations, such as Fowler's solution, will help stimulate red blood cell reproduction.

The entire herd, including the sick ones, should be treated for removal of lice and round worms. 3% to 5% creolin solution may

be used for delousing or they may be sprayed in close quarters with crude oil. For removal of round worms, oil of chenopodium and castor oil 1 to 16 may be used, one ounce per 50-pound pig. There are several other ascaricides which are equally effective.

Summary

1. A new disease of growing swine characterized by icterus and anemia is becoming a problem in the swine industry of the Middle West.

2. The etiology is as yet unknown. It is not caused by an Anaplasma as was previously believed.

3. Attempted direct and indirect transmission to healthy pigs has failed. However, the indirect method was attempted on only one pig and too much importance should not be placed on this failure.

4. Treatment is symptomatic.

Acknowledgments

To Dr. Herman Farley, whose aid in examining blood smears was invaluable and to Dr. L. M. Fulmer, for aid and cooperation in obtaining affected pigs for the research, grateful appreciation is extended by the author.

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It is an obligation of veterinarians in their private practices to render an efficient, honest, scientific veterinary service to the owners of livestock for a reasonable professional fee. This service should be rendered as promptly as circumstances warrant.

Estrum in a Dairy Cow Following Conception

A Holstein cow belonging to the Kansas State College dairy herd calved January 26, 1942, and was not bred for 57 days following parturition, at which time artificial insemination was employed, and again on April 18th, following a 25-day interval terminated by signs of estrum. Twenty-three days later this cow again came in heat and was artificially inseminated for the third time.

On June 6th, 33 days after the last insemination, the cow was examined by a veterinarian who reported a possible pregnancy. One month later she was examined again, per rectum, and pronounced definitely pregnant.

Three months elapsed with no visible deviations from a normal gestation, when on October 14th, the cow again showed definite signs of estrum. She was examined for the last time on October 22nd and pronounced unmistakably pregnant, thereby discrediting any assumption of abortion. External symptoms of pregnancy had developed by January 13, 1943.

BYRON QUINBY

Larned, Kans.

* * * *

False Masculine Hermaphrodism in Cattle

Recently, after answering a rural call, our attention was called to an animal obtained by the farmer in a recent steer purchase. This calf was born to an eight-year-old, grade Holstein cow in December, 1939, and was twin to a normal bull calf. Up until the time these twins were born, the dam had given birth to a normal calf each year. Although she came into estrous regularly, and had been served by two different bulls, she had not conceived since this calf was born and, in time, was sent to market because of sterility. This is the only condition of this kind that ever occurred on this farm. The sire was a purebred Holstein.

An examination of the calf revealed the normal build and appearance of a steer, a steer's voice, but no form of sexual desire was evident.

Hanging down in the normal location of the vulva and resembling it somewhat, was

a cylindrical-shaped tube about six inches long, through which urine dripped continuously. Further examination revealed within the tube a perfectly developed penis one and one-half inch long. Subcutaneously, on each side, just below the anus, were two nodes, each two inches in diameter, thought to be seminal vesicles or other accessory male genitalia.

Ventral examination showed two well developed testes located subcutaneously, there being no scrotum. Also, in their normal location, were four teats, such as one would expect to find in a normal yearling heifer.

According to Williams, the diagnosis would be false masculine hermaphrodism. An effort was made to have the animal butchered locally so as to conduct a post-mortem examination but the owner chose to fatten and sell it along with his steers.

CECIL L. PAULSEN

Onaga, Kans.

Congenital Contraction of the Flexor Tendons

August 15, 1942, while the writer was assistant to Dr. H. A. Alcorn of Adair, Iowa, a case of congenital contraction of the flexor tendons in both front legs of a week-old colt was presented to him.

In most cases of congenital contraction,

(A) Mule colt one week old walked on its fetlocks; (B) Splints developed by Dr. Alcorn used—no tendons cut—when removed there was little buckling

the deep digital flexor tendon alone is affected, sometimes only the superficial. However, in this case, it seemed both were affected. The contraction was so extensive that the colt was unable to extend the fetlock joints. It walked on the anterior surface of the fetlock. However, there were no visible bruises on this surface, showing there had been little strain upon the tissues.

The treatment, therefore, was not complicated. No tendons were cut. A thick layer of cotton was applied over the affected area. This was then covered with a splint made of a curved piece of 20-gauge galva-

Recovered colt could not be distinguished from its mate

nized iron, rounded to fit the part snugly and held in place by bandage material. No further treatment was given.

The splints were removed in one week from the time they were applied. At that time there was a marked improvement—only a small degree of contraction remaining and by December 1st recovery was complete.

The splints, such as used in this case, have been used successfully by Doctor Alcorn many times in treating this and similar conditions.

C. B. HOSTETLER.

Monticello, Illinois.

Eversion of Uterus in Cattle

The article by Dr. W. C. Glenny in the March issue of VETERINARY MEDICINE on "Eversion of Uterus in Cattle" is an excellent one. I wish to add to it my experience as to what to do if a cow is down, won't get up and has an everted uterus.

First, get yourself and all equipment, including plenty of warm soft water, ready. Then get a block and tackle, hitch it onto both hind legs of the cow above the fetlocks (that is better than if hitched above hocks, for that may injure the tendo-Achillis, thus the hamstrung animal can't get up when the job is done). When all is ready pull the rear end of cow up to an angle of about 45 to 50 degrees. Then wash the uterus fairly

well with weak antiseptic solution, after that put a fair amount of mineral oil over the entire everted mass.

With the cow elevated this way the operator can stand up, and in a little time the uterus will be returned to its proper position. The cow can't strain against the operator so much when a goodly portion of her weight is suspended from her hind legs. Gravitation assists materially in forcing the uterus back down through the pelvic inlet.

After the uterus is replaced pour in one quart of the oil, then insert the arm full length and straighten out any kinks or folds in the uterus and distribute the oil to all parts of its interior. Then place four or five deep sutures of ½-inch muslin strips through the lips of the vulva. Then let the cow down. If she won't get up, put straw or hay under her rear end so it will be elevated to some extent above the remainder of the body. Usually in an hour or two the cow will get up. A good barking dog, set on such cows will usually make them jump up.

A good dose of camphorated oil intramuscularly should be given when all is done, or probably better before the replacement is started.

Make another trip, 24 to 30 hours later, and remove the sutures and irrigate the uterus with several gallons of warm, weak antiseptic solution; wait a few minutes until the solution has been strained out, then put in two or three uterine capsules. The washing out process will wash out all bits of straw or after birth that may have been clinging to the uterus and overlooked when it was replaced.

If there isn't too much hemorrhage and uterus is not torn, these cases do well. In ewes the same procedure gives equally good results.

If the cow has a fever 24 to 30 hours later, then have the owner give 180 grains of sulfanilamide every six hours. This may have to be kept up two or three days.

F. C. MECHSTROTH

Coldwater, Ohio

★ ★ ★ BUY WAR SAVINGS STAMPS AND BONDS

Sulfanilamide Therapy in a Case of Eimeria canis

October 10, 1942, a buff cocker spaniel, about three months of age and showing a marked enteritis, was admitted to the hospital. There was a history of a recent attack of canine distemper from which the dog had recovered. During the day and night previous to admission to the hospital, there had been a marked diarrhea.

Clinical examination revealed no symptoms other than the diarrhea. The temperature was normal and the dog appeared to be in good condition. The feces were markedly mucous and green in color, with slight traces of blood but too slight to indicate any marked hemorrhagic condition of the intestines. A definite diagnosis of coccidiosis was arrived at after a flotation examination of the feces was made.

Treatment consisted of a double dosage of sulfanilamide daily for seven days. Since the dog weighed 10 pounds, 20 grains per day, divided into four doses, was administered. During the course of the treatment, there was a slight elevation of temperature; the highest recording being 103° F. After the first two days of treatment, the diarrhea ceased and the feces were fully formed and of normal color. On the fifth day a flotation examination of the feces was negative for oocysts, but the treatment was continued for two days longer.

During treatment with large doses of sulfanilamide, the mucous membranes remained normal in color and no evidence of cyanosis could be seen. No toxic effects were noted and the slight elevation in temperature was the only abnormal manifestation during the treatment. The dog appeared normal and healthy as soon as the diarrhea ceased on the second day of treatment.

EDWARD D. STODDARD

Manhattan, Kans.

Abstracts

Comparisons

In studies of the bactericidal activity of gramicidin, tyrothricin and tyrocidine, Robinson and Graessle[34] found that the last two appear to exert a decided bactericidal action on aerobic and anaerobic gram-positive bacteria in the absence of blood or serum; under similar conditions gramicidin appears to be primarily bacteriostatic. When blood or serum is present tyrocidine and tyrothricin lose their bactericidal properties, whereas gramicidin retains its bacteriostatic properties; under these conditions tyrothricin becomes primarily bacteriostatic. The *in vivo* results indicate that gramicidin and tyrothricin intraperitoneally in infected mice are active whereas tyrocidin is not. Gramicidin or tyrothricin are effective only when given in direct contact with the infecting bacteria. Oral, subcutaneous or intravenous treatment do not protect mice infected perineally. Likewise, mice infected by vein are not protected by intraperitoneal treatment.

* * * *

Epizootics of Anthrax

The incidence[30] of anthrax in Norway, Sweden and Denmark varies directly with the quantity of oil cake imported as fodder from certain countries. Thus in the blockade years of the last war, the incidence reached a low level. There is no explanation for the variation in virulence of the outbreaks or the occasional occurrence of unusually large numbers of cases as in the so-called "anthrax-years" of 1905 and 1911. In a quarter of the outbreaks that occur in Denmark and less frequently in Sweden, secondary outbreaks develop, usually appearing 2 to 5 days after the primary case. From 1914 to 1937 in Sweden the relative incidence in the horse, ox, sheep, and pig was as 4:50:1:1. In Denmark the proportion was one horse to 120 cattle to one pig. In Denmark only three cases have occurred in sheep in 31 years. The death rate is not known in Sweden, but Plum gives it in Denmark as horses 91.4%, cattle 74.3%, sheep 78%, pigs 45.9%, and dogs 54%. The disease is most common in the winter in Denmark and Norway but in the summer in Sweden. This is believed to be due to heavier pasture infection in Sweden.

The 58 horses that died in the epizootic in Norway in 1937 exhibited a wide variety of symptoms, none of which was characteristic. In the several serious outbreaks involving cattle the signs of illness, apart from a constant high temperature, differed widely and included diarrhea, edema of the neck and brisket, and stomatitis. The stomatitis was reminiscent of foot-and-mouth disease. In pigs swelling of the throat was not constant. Serious outbreaks were always associated with the contamination of the surroundings by blood of an affected animal, the precautions required for dealing with animals suspected to have died from anthrax not having been taken. A further cause of spread is by dissemination of infective animal products such as by the sale of the hide for shoe leather or the use of the carcass as food for foxes or pigs. In the Norweigian epizootic referred to above, flies of various types were trapped on an anthrax carcass and were found to be contaminated by virulent bacilli. Not until domestic animals were withdrawn from the pastures was this outbreak brought under control (blood-sucking flies are especially active in the Baltic countries in summer).

Treatment was usually applied in herds in which secondary outbreaks were occurring or expected. It included recording of temperatures as often as possible during the day and early prophylactic administration of serum. With a rise of temperature the patient was isolated in the coldest possible atmosphere and given cold water douches, together with massive doses of serum intravenously and subcutneously (150cc and over), and camphor and antifebrin therapy. The author records good results but stresses the importance of the so-called "cold treatment." If treatment was successful, recovery ensued in about one week. Serum was used prophylactically only in the case of cattle using the same fodder box as the primarily affected animal. In any

[34] Robinson, H. J., and O. E. Graessle, 1942. *In vitro* and *in vivo* studies of gramicidin, tyrothricin and tyrocidin. *Jnl. Phar. Expt. Ther.*, 76, p. 316.

[30] Christenson, I., 1942. An epizoological and clinical study of anthrax. *Skand. Vet. Tidskr. 32*, pp. 225-256. Abst. by G. B. Brook in *Vet. Bul. 13:1.*

serious epidemic, vaccine-serum immunization is recommended.

In view of the many advocates of the importation of protein feeds, because of the shortage in this country, discussions of anthrax possess a particular interest for American veterinarians at this time.

Diseases of Ostriches

A general article[32] on the ostrich and its domestication with special reference to South African experience. The chief diseases under farming conditions are briefly described. They include paralysis of the feet, which affects young birds and may be infectious, helminthiasis (*Taenia struthionis, Strongylus douglasi*), yellow liver disease of unknown causation, and poisoning by various plants, the most common of which are wild tobacco, *Datura* spp.,*Opuntia tuna,* and *Nerium oleander.*

Raising Calves and Conserving Milk

High production is the most important factor in economical milk production.[7] This economical high production is not possible, however, unless dairy animals, grade or purebred, are well bred and properly raised. Since at least 5,000,000 heifer calves must be raised each year to provide replacements for United States dairy herds, it is extremely important that dairymen know how to care for and feed their calves, especially when certain commonly used feeds are restricted.

It has been stated that efficient reproduction depends upon the satisfaction of all nutritive requirements which includes that needed in the production of live, vigorous offspring. Surveys have shown that in a large herd studied over a 10-year period, 12% of the calves were born dead or died at birth, and 11% of those born alive died early in life. Reduction of this 23% loss of a potential calf crop is a matter of proper nutrition and disease control, as well as of management. One of the first steps in a successful calf raising program, therefore, would be to supply dams adequate energy foods, protein, minerals and vitamins. A second step is feeding the newborn calves themselves, and to do that properly, knowledge of their basic nutritional needs is necessary.

At birth the energy requirement is readily met by the colostrum the calf takes or the 6 to 8 pounds of whole milk it is allowed daily during the first week. The energy requirement increases as the calf grows, and milk intake increases correspondingly until 1 pound is fed for each 10 lbs. liveweight. As the calf grows and its energy requirement increases, grain and hay are added as sources of energy and can replace milk entirely for this purpose.

Little is known about the protein needs of young calves. Whole milk contains 3.5%; on a dry basis, 35% protein. Experience has shown that when milk in some form is given, a grain mixture containing 15 to 20% total protein is adequate. When milk is restricted, calf meals containing 24% protein have been used successfully.

Calcium and phosphorus are needed in rather large quantities by growing calves. So long as milk is fed, adequate calcium and phosphorus will be supplied but after milk is discontinued 1 to 2% of calcium and phosphorus supplements, such as steamed bone meal and 1% salt, should be added to the grain ration or supplied free-choice separately. In goitrous and semi-goitrous areas, the salt should be iodized.

The feed of young calves must contain vitamins A and D. A calf is born with little, if any, store of these two vitamins. Colostrum and the subsequent whole milk may or may not contain adequate amounts of vitamin A, depending upon the ration of the cow. Milk is deficient in vitamin D, since a calf can develop rickets on an exclusive milk diet. Often calves consume insufficient hay for six to eight weeks to supply their needs, therefore, vitamins A and D should be present in the grain mixture or be fed separately. It is advisable to feed daily two teaspoonfuls of fish liver oil or one-half teaspoonful of a fish liver oil concentrate during the first six weeks, especially is this necessary during the winter. Calves should be provided with all the water they want at all times.

[32] Schale, E., 1942, Der Straus als Wirtschaftstier, *Z. Tier. Zucht. Biol. 52,* pp. 263-279. Abst. in *Vet. Bul. 13:5.*

[7] Krauss, W. E., 1942. War emergency plans for raising calves and heifers. *Bimonthly Bul.* O. Agr. Exp. Sta 27:218, pp. 149-155.

There are three methods of feeding calves —nurse cow method, whole milk-skimmilk method and the dry feed system. If the dry feed systems recommended were universally adapted, there would be diverted for emergency purposes 500,000,000 pounds of whole milk and at least 2,500,000,000 pounds of skimmilk.

When the dry feed system of calf raising is followed, the calf is started on grain as early as possible and continued on it until at least four months of age, when a simpler heifer mixture can be used. Good quality hay and water are given as usual. Holstein calves were raised to normal size at six months on the following milk substitute ration, which includes only 200 pounds of whole milk and no skimmilk.

Ground yellow corn	100 pounds
Ground oats	150 "
Wheat bran	50 "
Linseed oil meal	50 "
Dried blood, skimmilk powder, fish meal or dry-rendered tankage	50 "
Minerals—equal parts salt, bonemeal, limestone	12 "

The success of any calf feeding program can be judged by the appearance and activity of the animal, the presence or absence of scours, and the apparent weight development. Calves six months of age and over are treated alike, regardless of the system used to raise them. Their rations can be simple and cheap and at the same time adequate. Good pasture and good hay are essential. Silage may or may not be used, but some simple grain mixture should be fed, as well as free access to a mineral mixture. Two months before calving, heifers should receive extra attention, because they should be in good flesh when they drop their first calves at 24 to 27 months of age.

No matter how good his feeding program, the dairyman will have trouble in rearing calves if he does not observe certain management and sanitation principles. The following suggestions may be helpful in avoiding trouble: If at all possible keep calves in separate pens, keep their surroundings clean and sterilize daily the utensils used, treat each calf as an individual, give the calves good hay and fresh water daily. Feed regularly, but do not overfeed them.

Book Reviews

Microbiology of Meats by *L. B. Jensen*, A.B., M.Sc., Ph.D., Chief Bacteriologist, Swift and Company; formerly Assistant Professor of Experimental Bacteriology, Mayo Foundation; formerly Instructor in Bacteriology, University of Chicago; formerly President of Society of Illinois Bacteriologists. 252 pages. Published by the Garrard Press, Champaign, Illinois, 1942. Price $4.00.

This work deals with the industrial microbiology of meat foods. It is a story of a race—a race between man and microbes for the finished products of the meat packers art. This contest has been going on from time immemorial. To help him, man has employed empirically some of the data of bacteriology—Northern peoples employed refrigeration in the earliest records revealed by the archeologist, salt curing and smoking were old in the time of Homer, saltpeter was used in India before the Christian era, the voyage of Columbus was motivated by a desire for spices with which to preserve meat or mask the effects of bacterial growth and when white men first visited the western plains and mountains of this country, they found the natives defeating the microbes by drying strips of lean buffalo meat, a practice that antedated tradition.

Bacteriological research came to the aid of the meat industry only a little more than two decades ago, but it has served the industry fruitfully during that period. "Microbiology of Meats" is probably the best record of that research yet published and the best summary of its results. Contrary to popular conception not all bacteria and molds injure meat. Some of them improve it. Some 50 major processes in the meat packing industry are dependent upon the action of beneficial organisms. The author states that "the real job of the food technologist today is to produce and sell food value, sanitation and service rather than vitamins and medicinal ingredients of foods.

This volume includes chapters, as follows: Effects of Sodium Nitrate on Bacteria in Meat, Gaseous Fermentation in Meat Products, Bacteriology of Green Discolorations in Meats, Action of Microörganisms on

Fats, A Study of Ham Souring, Microbiology of Eeef, Bacteriology of Sausage, Control of Microörganisms, Bacteriology of Spices, Sait, Sugar, Paper, and Wood, and A Summary of Food Poisoning of Bacterial Origin.

No sounder reasons, than this work contains, can be given for the maintenance of hygienic conditions and sanitary practices in meat processing. No veterinarian engaged in food inspection should fail to procure a copy of this book.

You may obtain any book reviewed in this department by remitting the published price to the Book Department of VETERINARY MEDICINE, 7632 S. Crandon Ave., Chicago, Ill.

The Story of Meat by *Robert B. Hinman*, Professor of Animal Husbandry at Cornell University and *Robert B. Harris*, formerly in charge of the Department of English, New York Food Trade Vocational High School. 291 pages, 164 illustrations. Published by Swift and Company, Chicago, 1942. Price $1.00.

This text was written for students in vocational high schools, primarily for young men who plan to make a career of the retail meat business. "It specializes in supplying significant facts about meat which are not likely to have come to the attention of even a star pupil in the school of experience."

The "Story of Meat" deals with history, economics and nutrition. It gives the highlights in the development of the meat industry from the days of cave men to the present. A high tribute is paid to the Federal meat inspection. The necessity for cleanliness and sanitation in the retail trade is emphasized.

The following chapter heads indicate the scope of the work: Meat Through the Ages, The Meat Industry Before 1860. The Meat Industry since 1860, Raising and Marketing of Livestock, Main Functions of the Meat Packing Industry, Classes and Grades of Meat, Meat Inspection, Preservation of Meat, Manufacture of Sausage, Poultry, The Retail Trade, Price Determination, Meat Preferences and Habits of Consumers, Meat in the Well Balanced Diet and Vocational Opportunities. The detail with which these subjects are discussed is indicated by the following subheads in the chapter on Poultry: Chickens, turkeys, ducks, geese, squabs, pigeons, guinea hens—Definition of poultry—Poultry industry very extensive—Four main poultry regions—Middle West—Northeast—Pacific Coast—South—Chicken breeds found in America—Marketing a difficult problem—Marketing live poultry—Marketing dressed poultry — Organization of poultry dealers—Classifications in New York live poultry market—New York classification of dressed poultry—Additional classification of dressed poultry—Poultry finishing — Dressing methods: Wax-picking — Dry-picking — Semi-scalding — Scalding—Preservation of dressed poultry: Chilled or "fresh-killed"—Freezing—Quick freezing—Dressed and full-drawn—Packing methods—Grades: Live poultry — Grades: Dressed poultry — Classification of dressed chickens according to kind, age, sex, and weight—Classification of dressed chickens according to method of picking, dressing, finishing, chilling, and packing — Grades for dressed chickens — Definition of terms used in the tentative U. S. standards and grades for dressed chickens — Other poultry — Turkeys—Long Island ducklings—Western ducks—Geese—Guinea fowl — Squabs — Pigeons — Game birds.

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Rabbit Raising. (Conservation Bulletin No. 25, Fish and Wildlife Service, U. S. Department of the Interior.) A 64-page booklet dealing with feeds and feeding; breeding, management, equipment, marketing (both live and dressed), skinning and curing of the skin. Included are many drawings, with specifications for the building of hutches, self-feeders and crates for shipping live rabbits. *Superintendent of Documents*, U. S. Printing Office, Washington, D. C. 10 cents.

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